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U. S. Government RESEARCH REPORTS

December 11, 1959
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Optimum Nuclear Reactor-Saline Water Evapo rator Process

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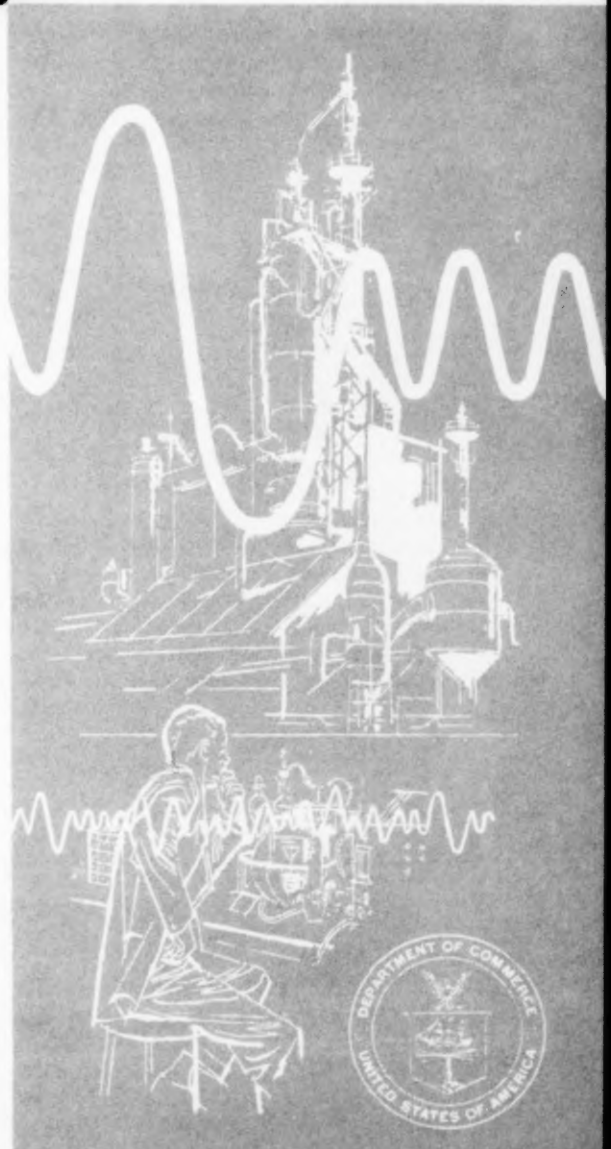

U. S. DEPARTMENT OF COMMERCE
Office of Technical Services

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U. S. DEPARTMENT OF COMMERCE
Frederick H. Mueller, Secretary

OFFICE OF TECHNICAL SERVICES
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Use of funds for printing this publication has been approved by the Director of the Bureau of the Budget, July 18, 1958.

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Aerodynamic heating of iron meteorites during entry into the atmosphere. Apr 59. 113p. (PB 161 008) $2.50 762

BEHAVIORAL SCIENCES

Effects of variations in control backlash and gain on tracking performance. Jan 59. 21p. (PB 151 745) 75 cents 668

BIOLOGICAL SCIENCES

Influence of staphylococcal enterotoxin on influenza virus infectivity in the embryonated egg. May 59. 17p. (PB 151 973) 50 cents 678

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CHEMISTRY

Molten carbonates; bibliography and literature review for lithium, sodium, potassium carbonates. Sep 58. 77p. (PB 151 991) $2.00 683

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ENGINEERING

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Development of notch-ductile stress-relieved weld-metal for the fabrication of dynamically T-1 steel structures. Apr 59. 64p. (PB 151 990) $1.75 723

Fore-detection requirements for the Martin XP6M-1 airplane powerplant. Dec 58. 19p. (PB 151 576) 50 cents 696

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Simulation of proposed ATC procedures for civil jets aircraft. Dec 58. 25p. (PB 151 426) 75 cents 697

Speed of reaching to critical control areas in a fighter-type cockpit. June 59. (PB 161 038) 75 cents 695

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ENGINEERING (con.)

Study and preliminary design of a high temperature aircraft wheel, brake, and tire assembly. May 59. 84p. (PB 161 041) $2.25 694

Study of environmental temperature and pressure effects on the plate dissipation rating of receiving tubes. Dec 57. 54p. (PB 131 976) $1.50 703

Tensile properties of aircraft-structural metals at various rates of loading after rapid heating. May 59. 187p. (PB 151 895) $3.00 696

Theory of electrochemical cell reactions. Volume 6. Part 3. Electorchemical cells with alkaline electrolytes. Apr 58. 106p. (PB 161 015) $2.50 715

Thermoelectricity abstracts. Aug 59. 81p. (PB 151 810) $2.25 710

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Variable-reactance parametric amplifiers: A selected bibliography. Mar 59. 10p. (PB 151 965) 50 cents 704

MACHINERY, FABRICATION, AND ACCESSORY EQUIPMENT

Analysis of the avoidance of collision between aircraft on curvilinear flight trajectories. Aug 59. 17p. (PB 151 769) 50 cents 728

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MISCELLANEOUS

Report of NRL progress. Nov 59. (PB 151 344) $1.25, $10.00/year 778

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NUCLEAR PHYSICS AND NUCLEAR CHEMISTRY

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Design of ventilated clothing. Mar 59. 22p. (PB 151 874) 75 cents 759

High-altitude, partial pressure suits designed with double capstans, ventilation layers, and partial pressure and full pressure socks. June 59. 17p. (PB 161 053) 50 cents 759

PHYSICS

Effects of high constant pressure sound fields on free convection heat transfer from a horizontal cylinder. Dec 58. 64p. (PB 151 712) $1.75 769

Investigation and evaluation of various processes in solid state and gaseous electronics. Part I. Crystal-growth processes and a design study for a crystal-growth facility. June 59. 143p. (PB 161 009) $2.75 762

Investigation and evaluation of various processes in solid state and gaseous electronics. Part II. Gaseous-plasma physics. June 59. 105p. (PB 161 011) $2.50 762

RESEARCH METHODS, TECHNIQUES AND EQUIPMENT

"No backlash" Universal Joint. Mar 59. 23p. (PB 161 031) 75 cents 777

U. S. DEPARTMENT OF COMMERCE

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U. S. Government RESEARCH REPORTS

Vol. 32, No. 6 Pp. 663 - 792 December 11, 1959

ASTRONOMY

Air Force Missile Development Center, Holloman AFB, N. Mex.
PLANETARY ASTRONOMY FROM SATELLITE-SUBSTITUTE VEHICLES. I. A REVIEW OF METEOROLOGICAL AND ASTROPHYSICAL PROGRAMS FOR OBSERVATORIES CARRIED EFFECTIVELY INTO SPACE BY SATELLITE-SUBSTITUTE VEHICLES, by John Strong. July 59, 27p. 7 refs. AFMDC TN-59-22.
Order from LC mi$2.70, ph$4.80 PB 143 187

This report is concerned with a review of significant meteorological and astrophysical programs that can be opened up, if not completely handled, using currently available ballons and high altitude aircraft as vehicles to carry meteorological stations and astrophysical observatories effectively into space. It is also concerned with practical and achievable procedures for making the observations for these programs, and associated instrumentation - all of which can be of value to subsequent satellite programs.

Minnesota U. Observatory, Minneapolis.
A SEARCH FOR FAINT BLUE STARS. X: THE HYADES. XI: THE PLEIADES. XII: THE FAR SOUTHERN HEMISPHERE. XIII: PRAESEPE. XIV: THE URSA MAJOR REGION. XV: THE SPACE DISTRIBUTION OF CORONAL STARS. XVI: SOME SPECIAL REGIONS. MAGNITUDES AND COLORS FOR SOUTHERN WHITE DWARFS. ON THE FREQUENCY OF WHITE DWARFS IN SPACE, by Willem J. Luyten, Jean H. Anderson, and James A. Smith. Final rept. on Contract Nonr-1892(00). 30 June 58, 42p. 20 refs.
Order from LC mi$3.30, ph$7.80 PB 143 121

Astrophysics

Battelle Memorial Inst., Columbus, Ohio.
AERODYNAMIC HEATING OF IRON METEORITES DURING ENTRY INTO THE ATMOSPHERE, by Robert E. Maringer and George K. Manning. Rept. for 1 Apr 58-31 Mar 59 on Effect of Environment on the Internal Structure of Solids, Contract AF 33(616)5080. Apr 59, 113p. 15 refs. WADC Technical rept. 59-164.
Order from OTS $2.50 PB 161 008

Specimens of eight iron meteorites have been examined. Four of these contained surface zones of structurally altered material resulting from the heat generated during their flight through the atmosphere. By comparing the structures and hardnesses in these zones with those of artificially heated meteoritic iron specimens, thermal gradients as they existed during flight have been reconstructed. From these data, using certain mechanistic and mathematical assumptions, it has been possible to estimate rates of heat flow through the meteorite surface and corresponding rates of ablation occurring during high-velocity flight. Various aspects of the structure and composition of meteoritic iron are discussed with respect to the origin and thermal history of the material.

Dublin Inst. for Advanced Studies (Eire).
FINAL TECHNICAL REPORT FOR 1 DECEMBER 1956 - 30 NOVEMBER 1958. Rept. on Contract AF 61(514)1164. [1958] 17p. 12 refs. AFOSR TR-59-54; AD-216 623.
Order from LC mi$2.40, ph$3.30 PB 143 031

Reports on progress in research on high energy cosmic ray showers.

Kiruna Geophysical Observatory (Sweden).
INTERPRETATION OF STRONG IONIZATION IN THE LOWER IONOSPHERE, OCCURRING IN HIGH LATITUDES WITHIN A FEW HOURS AFTER SOME SOLAR FLARES, by Bengt Hultqvist, Jules Aarons and Johannes Ortner. Scientific rept. no. 1 on Contract AF 61(514)1314. 1 Feb 59, 49p. 24 refs. AFCRC TN-59-184; AD-214 946.
Order from LC mi$3.30, ph$7.80 PB 142 908

The very strong effects in the auroral zone of the solar flares of 7 July 1958 as observed at Kiruna

Geophysical Observatory by means of magnetometers, an ionospheric sounder, a cosmic noise absorption receiver (riometer), oblique auroral reflection receivers, transpolar communications receivers, and cosmic ray telescopes are reported and discussed. Several remarkable features of the terrestrial disturbances were observed: Extremely strong absorption became apparent a few hours after the solar flare. The SIDs reported by Pacific Observatories at the time of the flares were not observed at Kiruna A magnetic storm and a large decrease in the counting rate of the meson component of cosmic radiation appeared simultaneously 31 hours after the flare. The maximum absorption at 27.6 Mc recorded during this period was 23 decibels.

New Hampshire U., Durham.
VARIATIONS IN THE COSMIC RAY NEUTRON INTENSITY, by J. A. Lockwood. Final rept. on Contract AF 19(604)1550. [1957] 99p. 69 refs. AFCRC TR-58-293.
Order from LC mi$5.40, ph$15.30 PB 142 920

Involves careful literature review and independent studies.

Yerkes Observatory, Williams Bay, Wis.
PHOTOMETRY OF I. G. Y. PATROL SPECTRA, by J. W. Chamberlain and V. Pesch. Scientific rept. no. 6 on Contract AF 19(604)3044. 6 Nov 58, 10p. AFCRC TN-59-211.
Order from LC mi$1.80, ph$1.80 PB 139 218

BEHAVIORAL SCIENCES

Human Engineering

Aero Medical Lab., Wright Air Development Center, Wright-Patterson AFB, Ohio.
EFFECTS OF VARIATIONS IN CONTROL BACKLASH AND GAIN ON TRACKING PERFORMANCE, by Marty R. Rockway and Paul E. Franks. Rept. on Human Engineering Factors in the Design of Operator Training Equipment. Jan 59, 21p. 7 refs. WADC Technical rept. 58-553; AD-209 384.
Order from OTS $0.75 PB 151 745

Six subjects performed a simulated aircraft tracking task using each of 12 control conditions resulting from combining four levels of control backlash and three levels of gain. The experimental findings demonstrated a significant interaction between the effects of backlash and gain on system performance. That is, there was a monotonic increase in system error with increasing backlash at all levels of gain. However, the higher the gain the greater the rate of increase. The implications of these results for the design of manual control systems were discussed briefly.

Army Medical Research Lab., Fort Knox, Ky.
PRECISE CONTROL MANIPULATION AS A FUNCTION OF CONTROL LOCATION, by Raymond C. Sidorsky. Rept. on Psychophysiological Studies. 25 July 57, 11p. 7 refs. Rept. no. 288; AD-139 058.
Order from LC mi$2.40, ph$3.30 PB 138 913

Ten subjects performed a compensatory tracking task using a rotary knob control. The location of the control was varied randomly over 11 positions distributed over most of the area that can be reached comfortably with the right hand. The results indicated that performance in the location directly overhead was significantly inferior to all others. None of the other locations differed significantly from each other.

Personnel and Training

Bureau of Naval Personnel [Washington, D. C.]
PSYCHOLOGICAL RESEARCH IN THE UNITED KINGDOM ROYAL NAVY, by A. S. Levine. 15 Dec 58, 11p. 1 ref.
Order from LC mi$2.40, ph$3.30 PB 139 173

It is the purpose of this paper to treat in broad brush fashion material of more general interest to people who are concerned with personnel research in the U. S. Navy. An attempt is made in the latter part of the paper to point out implications for the PO-2 research effort of the Personnel Research Division and its associated Field Activities.

Courtney and Co., Philadelphia, Pa.
DEVELOPMENT OF A SHIPBOARD SUPERVISORY TRAINING PROGRAM FOR PETTY OFFICERS, by Myron A. Fischl and Lois-ellin Datta. Rept. no. 17 on Contract Nonr-2212(00). 15 Nov 57, 79p. 37 refs. AD-149 980.
Order from LC mi$4.50, ph$12.30 PB 142 437

A research project was undertaken to develop and test a supervisory training program for petty officers in the fleet. The initial stages of the study are discussed these include the require requirements for a shipboard supervisory training program as depicted from interviews, and an investigation of the state-of-the-art in supervisory training as shown by a systematic perusal of all available literature in the training field published from 1950 to 1957. On the basis of these 2 sources, a program is proposed which considers administrative requirements and limitations, course content, and the course medium.

Iowa State U., Iowa City.
A NEW APTITUDE-FOR-SERVICE TEST (MULTIPLE CHOICE SENTENCE COMPLETIONS) by Arthur L. Benton and Harold P. Bechtoldt. Rept. on Research on Aptitude-for-Service Tests for Enlisted Personnel, Contract Nonr-311(00). 15 Mar 58, 12p. 2 refs.
Order from LC mi$2.40, ph$3.30 PB 139 297

On the basis of a preliminary analysis, primary attention was focused on the discriminative power of the items of Forms C and D, which involve ranking by the subject of three possible completions for an item in terms of the one which best describe how he thinks or

feels, the one which least well described how he thinks or feels, and the one which occupied an intermediate position in this respect. The forms, the development of which has been previously described (1) are presented in Appendixes A and B.

University of Southern California, Los Angeles.
SHIPBOARD OBSERVATION OF ELECTRONICS PERSONNEL: GENERAL CONCLUSIONS AND RECOMMENDATIONS FOR FURTHER RESEARCH, by William W. Grings. Technical rept. no. 7 on Contract Nonr-228(02). July 53, declassified 21 Apr 55. 35p. AD-18 109.
Order from LC mi$3.00, ph$6.30 PB 137 501

The research objectives are reexamined with respect to the degree of their attainment. Recommendations for future research are presented with respect to job requirements; methods of fleet training; learning to maintain new equipment; reading circuit diagrams; organization; sea duty prior to class A school; development of selective devices; the importance of an interest in electronics; paper work; the role of logical analysis in trouble shooting; problem-solving research; technological changes; equipment operational characteristics; methodological studies; extension of observations; and performance criteria.

Washington U., Seattle.
AN ITERATIVE SELECTION OF VARIABLES FOR PREDICTING CERTAIN CRITERIA OF ACADEMIC SUCCESS AT THE UNIVERSITY OF WASHINGTON, by Donald Frank Mills. Rept. on Prediction Selector Techniques, Contract Nonr-477(08). Aug 57, 171p. 43 refs. AD-141 839.
Order from LC mi$8.10, ph$27.30 PB 138 969

Prediction studies at the University of Washington have led to the development and/or use of procedures for multivariate predictions of single criteria, multiple absolute predictions, and multiple differential predictions of criteria of academic success in institutions of higher learning. Twenty-seven predictor measures had been studied with reference to four years of University study by freshmen who entered in 1949. Sixteen of these predictor measures were then selected to complete multiple differential predictions of achievement in each of thirty-two University subject areas and all-University average for freshmen who entered the University in 1953. Follow-up studies of these students indicated that the actual accuracy of these multiple differential predictions for some criteria was considerably less than the expected accuracy of these estimates.

Psychology

Arizona State Coll., Tempe.
LANGUAGE CONDITIONING OF MEANING AS A FUNCTION OF NUMBER OF TRIALS, by Arthur W. Staats and Carolyn K. Staats. Technical rept. no. 3 on Psychological Processes in Language Communication, Contract Nonr-2305(00). [1957] 14p. 11 refs.
Order from LC mi$2.40, ph$3.30 PB 139 206

The method of language conditioning of meaning was used to see if the extent of conditioned meaning was a function of the number of conditioning trials. Different groups of Ss were run with from 0 to 18 language conditioning trials on two nonsense syllables. One CS-syllable was always conditioned by UCS-words with positive evaluative meaning, another syllable by negative evaluative words. The evaluative meaning of the nonsense syllables was measured after conditioning. It was found that there was a significant regression of mean evaluative meaning scores of the positively conditioned nonsense syllable as a function of the number of conditioning trials. The regression was almost significant for the negatively conditioned syllable. When both directions of conditioning were considered together the effect of number of conditioning trials was significant. Analysis of the data indicated that a significant amount of conditioning was obtained with only 8 conditioning trials.

Bureau of Applied Social Research, Columbia U., New York.
INDIVIDUAL PERFORMANCE AND GROUP PERFORMANCE IN PROBLEM SOLVING RELATED TO GROUP SIZE AND PREVIOUS EXPOSURE TO THE PROBLEM, by Irving Lorge and Herbert Solomon. Technical rept. no. 2 on Group Process and Group Efficiency in Problem Solving, Contract Nonr-266(43). 15 Apr 58, 13p. 4 refs.
Order from LC mi$2.40, ph$3.30 PB 139 257

City Coll. of the City of New York.
AFFIRMATIVE PERSONALITY TRENDS AND RESPONSE TO NEW GROUPS, by Ruth E. Hartley. Technical rept. no. 9 on Acceptance of New Reference Groups, Contract Nonr-1597(01). 15 Mar 58, 13p. 41 refs.
Order from LC mi$2.40, ph$3.30 PB 139 178

This paper presents data testing the hypotheses that responses to items on certain "personality" schedules may reflect generalized acceptance of conventional social values rather than idiosyncratic personality patterning, that acceptance of such values may be indicative of a pervasive readiness to respond positively to social experiences and that such a pervasive tendency should facilitate psychological identification with new membership groups, and be associated with the ready acceptance of such groups as reference groups.

City Coll. of the City of New York.
NORM COMPATIBILITY NORM PREFERENCE AND THE ACCEPTANCE OF A NEW REFERENCE GROUP, by Ruth E. Hartley. Technical rept. no. 7 on Acceptance of New Reference Groups, Contract Nonr-1597(01). 1 Mar 58, 29p. 15 refs.
Order from LC mi$2.70, ph$4.80 PB 139 189

City Coll. of the City of New York.
RELATIONSHIPS BETWEEN PERCEIVED VALUES

AND ACCEPTANCE OF A NEW REFERENCE GROUP, by Ruth E. Hartley. Technical rept. no. 8 on Acceptance of New Reference Groups, Contract Nonr-1597(01). 1 Mar 58, 16p. 6 refs. AD-156 973.
Order from LC mi$2.40, ph$3.30 PB 139 190

This paper reports the results of an investigation of the relationship between perception of value congruity and acceptance of a new reference group. Subjects were 146 male college freshmen.

City Coll. of the City of New York.
VARIABLES ASSOCIATED WITH ACCEPTANCE OF THE NAVY AS A REFERENCE GROUP, by Ruth E. Hartley. Technical rept. no. 10 on Acceptance of New Reference Groups, Contract Nonr-1597(01). 15 Mar 58, 33p. 20 refs.
Order from LC mi$3.00, ph$6.30 PB 139 176

Educational Testing Service, Princeton, N. J.
A COMPARISON OF NEED-ACHIEVEMENT STORIES WRITTEN BY EXPERIMENTALLY "RELAXED" AND "ACHIEVEMENT-ORIENTED" SUBJECTS: EFFECTS OBTAINED WITH NEW PICTURES AND REVISED SCORING CATEGORIES, by Henry N. Ricciuti and Russell A. Clark. Rept. on Contract Nonr-694(00). Sep 57, 28p. 8 refs.
Order from LC mi$2.70, ph$4.80 PB 138 907

The present study was undertaken with the following specific objectives in mind: (a) to determine whether "achievement-oriented" subjects obtain higher total scores on the achievement motivation test than "relaxed" subjects, when scoring system D-2 is used along with a greater variety of test pictures; (b) to evaluate the relative validity of specific scoring categories in scoring system D-2, and of individual pictures in terms of their capacity to discriminate between the achievement-oriented and relaxed groups; (c) where possible, to compare the relative "theoretical" validities of scoring categories and pictures with validities obtained in the original experimental validation study, as well as with those obtained in the more recent grade validation studies and to determine whether the achievement-oriented subjects write longer stories than the relaxed subjects.

Educational Testing Service, Princeton, N. J.
FLEXIBILITY IN INTELLECTUAL PERFORMANCE, by Barbara Wand. Doctoral thesis. Rept. on Contract Nonr-694(00). Apr 58, 151p. 56 refs.
Order from LC mi$7.50, ph$24.30 PB 139 335

The present investigation represents an attempt to extend the study of individual differences in flexibility into the area of problem-solving.

Educational Testing Service, Princeton, N. J.
PERSONALITY AND ABILITY CORRELATES OF ACQUIESCENT RESPONSE SET AND "AUTHORITARIAN" CONTENT, by Samuel Messick and Norman Fredericksen. Rept. on Contract Nonr-694(00). Mar 58, 25p. 27 refs. AD-202 606.
Order from LC mi$2.70, ph$4.80 PB 139 192

A modified form of the California F Scale of Authoritarianism containing 15 items from the original scale and 15 reversed statements was administered to 256 Naval Air Cadets, along with a battery of specific ability and personality measures. Separate scores were obtained from the modified F scale for acquiescent response set and authoritarian content. The set score had substantial reliability (.50), but the reliability of the authoritarian score (.14) suggests extreme heterogeneity of content. Acquiescence and authoritarian content were uncorrelated for the present sample. The correlations of ability tests with acquiescent set and authoritarian content suggested that (a) previously obtained correlations between "authoritarianism" and general intelligence reflected mainly the specific abilities of Verbal Knowledge and General Reasoning, and (b) correlations between the F scale and intelligence primarily involved acquiescent set and only partially involved consistent authoritarian ideology.

Fordham U. School of Education, New York.
THE IMMEDIATE AND LONG RANGE GOALS OF MALE HIGH SCHOOL SENIORS AND COLLEGE FRESHMEN, by Francis J. Crowley and Pauline C. Magee. Technical rept. no. 1 on Contract Nonr-880(02). July 57, 87p. 7 refs. AD-140 826.
Order from LC mi$4.80, ph$13.80 PB 138 920

Data for use by the armed forces in making reenlistment more attractive were sought concerning the goals of male adolescents, the obstacles to these goals, and the means to make their realization possible. Differences in the stated goals, obstacles, and means were classified according to intellectual ability, socioeconomic level, immediate expected future, educational level, and the type of high school attended. Data were obtained from a 193-item checklist administered to 131 college freshmen and 485 high school subjects. Academic students were more interested in altruistic and human relations goals on the lifetime level than in financial goals. Subjects were not greatly interested in fame or glory unless related to or concomitant with the achievement of personal or altruistic goals.

Fordham U. School of Education, New York.
TEACHER ESTIMATES OF IMMEDIATE AND LONG RANGE GOALS OF MALE HIGH SCHOOL SENIORS, by Francis J. Crowley and Pauline C. Magee. Technical rept. no. 2 on Contract Nonr-880(02). Apr 58, 78p. 3 refs.
Order from LC mi$4.50, ph$12.30 PB 138 836

The general plan of the present study was to obtain estimates of male high school senior goals from high school teachers, and to compare these estimates with the seniors' responses obtained in the earlier study. The same checklist was employed and the same schools participated in each of the studies.

Israel Inst. of Applied Social Research.
A STOCHASTIC FACET THEORY OF SOCIAL INTERACTION IN THE DYAD, by Uriel G. Foa and Shelemyahu Zacks (Israel Inst. of Tech.). Technical scientific note no. 1 on Contract AF 61(052)121. Apr 59, 68p. 14 refs. AFOSR-TN-59-446; AD-214 808.
Order from LC mi$3.90, ph$10.80 PB 143 177

The model described attempts to predict how the reciprocal behavioral expectations of two interacting persons change in time as a result of their intervening perceptions of behavior. Behavior is classified into four states, according to whether it does or does not conform to the corresponding norms of the actor and/or of the other person. Expectation changes from one state to another are described as a result of four distinct but interlocked processes: two intrapersonal processes (one for each person) and two interpersonal processes (one for each person). It is shown that the probability of a given future behavior of a person can be predicted from the knowledge of what he did before and of the reaction of the other to his earlier behavior.

Laboratory of Social Relations, Harvard U., Cambridge, Mass.
PERCEPTUAL AND COGNITIVE PROCESSES IN INTERPERSONAL RELATIONS. Annual rept. on Contract N5ori-07670. 1 Feb 58, 22p. 15 refs.
Order from LC mi$2.70, ph$4.80 PB 143 033

The present Annual Report reviews the progress made during the last year under the four major areas of the project. (A) The overall problem of describing and understanding the processes of "perception" of persons as stimulus objects, (B) Perception of interpersonal feelings among members of groups, (C) Cognitive and perceptual processes in judging characteristics of people, (D) Miscellaneous projects.

Louisiana State U., Baton Rouge.
COMPARISON OF THE CONSTRUCT VALIDITIES OF THREE OBJECTIVE MEASURES OF SUCCESSFUL LEADERSHIP, by Austin W. Flint and Bernard M. Bass. Technical rept. no. 17 on Behavior in Groups, Contract N7onr-35609. May 58, 22p. 9 refs.
Order from LC mi$2.70, ph$4.80 PB 138 821

This report compared the construct validity of 3 measures of successful leadership by examining the correlations between the measures and the ability of 255 subjects, their esteem and their rated success as leaders.

Maryland U., College Park.
EXPLORATORY STUDIES OF VERBAL CONTEXT BY MEANS OF CLUSTERING IN FREE RECALL, by Richard C. Gonsalez and Charles N. Cofer. Technical rept. no. 19 on Learning, Retention and Recovery of Meaningful Materials, Contract Nonr-595(04). Apr 58, 31p. 16 refs. AD-204 896.
Order from LC mi$3.00, ph$6.30 PB 139 259

The experiments explore in relatively simple situations some limited aspects of context. The series of studies made use of Bousfield's method for studying clustering in free recall.

Maryland U., College Park.
SOME NORMATIVE MATERIAL ON THE ADJECTIVE-VERB QUOTIENT, by David J. King and Charles N. Cofer. Technical rept. no. 11 on Learning, Retention, and Recovery of Meaningful Material, Contract Nonr-595(04). Sep 57, 12p. 14 refs.
Order from LC mi$2.40, ph$3.30 PB 138 908

A review of the previous work on Avq (adjective-verb quotient) is presented along with theoretical interpretations that were advanced and the objections raised in the use of the Avq. Results of a prediction system for the expected numbers of verbs, adjectives, and for the Avq are presented.

Michigan State U., East Lansing.
APPLICATION OF PROFILE TECHNIQUES FOR TRAINING AID EVALUATION, by I. R. Merrill. Rept. on Contract N61339-187. 6 Jan 59, 50p. 9 refs. Technical rept. NAVTRADEVCEN-602-11-1.
Order from LC mi$3.30, ph$7.80 PB 142 957

This study was performed to determine if students could validly rate their own degree of learning during classroom lectures. Students undergoing such instruction had available a scaled knob which could be manipulated to indicate relative amount of learning. To determine the validity of the rating scale, the obtained data were correlated with data from objective tests of learning. This study also provided an experimental setting for testing the educational value of some graphic training aids.

Office of Naval Research, Washington, D. C.
PHYSIOLOGICAL PSYCHOLOGY BRANCH: BIBLIOGRAPHY OF UNCLASSIFIED RESEARCH REPORTS, SUPPLEMENT NUMBER 5: JULY 1958-JULY 1959. 17p. 132 refs.
Order from LC mi$2.40, ph$3.30 PB 116 303S5

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Princeton U., N. J.
DISPOSITIONAL EFFECTS UPON CONFORMITY AT DIFFERENT DISCREPANCY LEVELS, by Harold M. Schroder. Technical rept. no. 3 on Contract Nonr-1858(12). [1957] 16p. 7 refs.
Order from LC mi$2.40, ph$3.30 PB 139 327

A number of studies have been concerned with the effects of variation in the discrepancy of a communication on attitude changes. Variation in discrepancy seems to produce some complex effects; under some conditions discrepancy and degree of change are positively related and under other conditions high discrepancy would appear to be associated with greater resistance to change. Since a number of interacting variables would appear to be operative in such studies, this report has narrowed the focus considerably.

Princeton U., N. J.
DISPOSITIONAL EFFECTS UPON CONFORMITY AT DIFFERENT LEVELS OF DISCREPANCY AND

STRUCTURE, by John McDavid, Jr. Technical rept. no. 4 on Contract Nonr-1858(12). [1957] 19p. 7 refs.
Order from LC mi$2.40, ph$3.30 PB 139 328

This study proposes to investigate the relationships between this dispositional tendency to respond either to the source of a communication or to the message communicated and yielding to group pressures in terms of (a) the amount of discrepancy between group judgment and the individual's own judgment, and (b) the amount of structure of the task.

Vanderbilt U., Nashville, Tenn.
RELATIONSHIP OF STATUS IN THE INFORMAL GROUP TO INFLUENCE AND INFLUENCIBILITY AT DIFFERING AGE LEVELS, by O. J. Harvey and Jeanne Rutherford. Technical rept. no. 3 on Contract Nonr-2149(02). [1958] 18p. 6 refs.
Order from LC mi$2.40, ph$3.30 PB 139 362

This study was concerned primarily with three questions: (1) the differential influence of highest and lowest status members of an informal group on the opinions of the other group members; (2) relationship of an individual's status in the group to his own influencibility; and (3) relationship of popularity to status and effective initiative. The measure of opinion change was the incidence of reversal of choices on the critical pair of pictures.

Virginia U., Charlottesville.
THE INFLUENCE OF CATEGORICAL CUING ON THE IDENTIFICATION OF VISUALLY DISTORTED WORDS SELECTED FROM A LOGICALLY ORGANIZED POPULATION, by Richard H. Henneman, L. Starling Reid, and Eugene R. Long. Rept. no. 7 on "SET" as a Determiner of Perceptual Responses, Contract W33-038-ac-21269. Apr 55, 19p. 9 refs.
WADC Technical rept. 54-362; AD-85 567.
Order from LC mi$2.40, ph$3.30 PB 129 569

In air communication the identification of ambiguous message signals is substantially aided by operator familiarity with the message population and by the high degree of contextual redundancy present. Previous laboratory research on perceptual setting as an aid to the identification of ambiguous messages has ignored the factors of familiarity and contextual organization. The present experiment constituted an attempt to learn whether further response restriction in the form of setting cues would facilitate the recognition of visually distorted words drawn from a logically organized population, when subjects were familiar with the word categories and the specific words. Experimental variables were (1) degree of categorical restriction (in cuing), (2) type of familiarization (categories only or categories plus specific words), and (3) temporal position of the setting cues (before or after stimulus presentation). Principal findings were: (1) Increases in categorical restriction led to improved identification. (2) Familiarity with specific words, apart from a knowledge of the word categories, significantly improved identification. (3) Temporal position of cuing was not a significant factor. These results imply the probable helpfulness of setting cues for the identification of ambiguous messages in operational situations where familiarity and context have already markedly restricted the operator's responses.

Washington U., St. Louis, Mo.
THE MEASUREMENT OF LEARNING: A REPORT OF A CONFERENCE HELD AT WASHINGTON UNIVERSITY, SAINT LOUIS, MISSOURI, 27 FEBRUARY 1958, ed. by Philip H. DuBois and Winton H. Manning. Technical rept. no. 6 on Contract Nonr-816(02). May 58, 59p. 9 refs.
Order from LC mi$3.60, ph$9.30 PB 143 134

Washington U., Seattle.
PREDICTOR ELIMINATION TECHNIQUES FOR DETERMINING MULTIPLE PREDICTION BATTERIES, by Paul Horst and Charlotte MacEwan. Rept. on Contract Nonr-477(08). Sep 57, 37p. 7 refs.
AD-144 187.
Order from LC mi$3.00, ph$6.30 PB 138 897

Computational procedures for determining an optimal battery of specified size for differential or for multiple absolute prediction are presented which consist of successive eliminations of the least efficient predictor until the battery of specified size remains. The respective efficiency indexes are appropriate in connection with a recursion formula for determining in any iteration the predictor variable which may be eliminated with the smallest resulting decrease in the value of the index. The predictor elimination procedures assume the availability of intercorrelation data for the set of potential predictors and validity data for all criterion variables. The inverse of the predictor intercorrelation matrix and the matrix of least-square regression vectors which correspond to the potential predictors are necessary. The diagonal elements of the matrix of covariances of the predicted criterion scores derived from the set of potential predictors must be calculated. The computational routines for determining the predictor to be eliminated and for obtaining the residual matrices are identical to those described previously. However, the matrix containing the elements of the inverse of the intercorrelation matrix for the subset of remaining predictors and the matrix containing the regression vectors for the subset of the remaining predictors are, respectively, used in place of the residual predictor intercorrelation matrix and the residual validity matrix.

Washington U., Seattle.
RE-ANALYSIS OF MOSIER'S FACTOR ANALYSIS OF NEUROTIC ITEMS, by Richard Morton Johnson. Rept. on Contract Nonr-477(08) and Public Health Research Grant M-743(C3). [1958] 58p. 10 refs.
Order from LC mi$3.60, ph$9.30 PB 143 098

It is shown that if the intercorrelations of the reference axes can be factored into a diagonal of specific factors and one or more vectors of second order general factors, then the second order general factors of the primaries must be imaginary. Conversely, if the correlations among the primaries can be factored into a diagonal of specifics and one or more vectors of second order general factors then the second order general factor loadings for the reference axes must be imaginary.

Washington U., Seattle.
RELATIONS BETWEEN NORMATIVE AND IPSATIVE MEASURES OF PERSONALITY, by Calvin E. Wright. Rept. on Contract Nonr-477(08) and Public Health Research Grant M-743(C2). Dec 57, 162p. 35 refs.
Order from LC mi$7.80, ph$25.80 PB 142 958

The purpose of the current study may be stated. Normative, normative ipsative, and empirically ipsative measures of personality are compared with respect to their reliabilities, correlations, intercorrelations, and factor structures. These particular measures were chosen so that the influence of the social desirability variable could also be investigated.

Washington U., Seattle.
SOCIAL DESIRABILITY IN A TWO-CHOICE PERSONALITY SCALE, by Max L. Hillmer, Jr. Rept. on Contract Nonr-477(08) and Public Health Research Grant M-743(C3). June 58, 39p. 7 refs.
Order from LC mi$3.00, ph$6.30 PB 142 955

An attempt was made to reduce the influence of social desirability of items as a determinant of item endorsement. A modification of Edwards' scale using the 135 discrete statements from the EPPS was derived from Wright's rating scale form of the EPPS. Intercorrelations between the present experimental inventories, the Rating Scale form, a Yes-No form, and the social desirability scale values of the items showed all forms of the inventory to be highly correlated not only with one another but with the variable of social desirability. As far as can be seen this latter will be operative whenever the subject has any opportunity to respond in terms of it.

BIOLOGICAL SCIENCES

California U. [Berkeley].
BIOCHEMISTRY AND BIOPHYSICS OF THE MITOTIC APPARATUS, by Daniel Mazia. Final rept. for 1 July 53-30 June 57 on Contract Nonr-222(24). 5 Mar 58, 4p. 9 refs.
Order from LC mi$1.80, ph$1.80 PB 139 256

In the results obtained, interesting information about the molecular character of the mitotic apparatus has been obtained, and this information has had some predictive value for the interpretation of the mechanisms of cell division and for their control.

Illinois U. Coll. of Medicine, Chicago.
CARDIAC ARRHYTHMIAS AND VENTRICULAR FIBRILLATION RESULTING FROM RAPID REVERSAL OF HYPERCARBIA, by Archer S. Gordon, Philip W. Andrews and others. Semi-annual progress rept. on Contract DA 18-108-cml-5365. Jan 58, 8p. 12 refs. AD-202 150.
Order from LC mi$1.80, ph$1.80 PB 138 965

Severe cardiac arrhythmias and ventricular fibrillation occurring during or immediately after surgery, and in resuscitative emergencies, pose a grave threat. Numerous etiologic factors have been incriminated in these conditions, but the exact mechanism frequently remains undetermined. One of the factors known to play a role is carbon dioxide retention. Accordingly, this study was undertaken to assess the role of rapid reversal of endogenous hypercarbia in the production of cardiac arrhythmias and ventricular fibrillation.

Anatomy and Physiology

Aero Medical Lab., Wright Air Development Center, Wright-Patterson AFB, Ohio.
A SUPINE SEAT FOR HIGH-STRESS TESTING OF PRIMATES, by L. Eisen and R. S. Zeigen. Rept. on Anthropology for Design. Apr 59, 23p. 1 ref. WADC Technical rept. 59-165.
Order from OTS $0.75 PB 151 976

This study summarizes the design rationale of a supine seat and restraint harness, with surrounding inclosure, for high stress bioscience experiments with a Macaca cynomolgus monkey (Macaca iris). This configuration is intended for test under various abnormal stresses including high g centrifuge runs. Testing and feeding of the subject in the inclosure will be accomplished to determine his reaction to these stresses. With minimum modification, the Macaque supine seat and restraint harness could accept any primate for ground tests or bio-experiments in space flight. A brief description of an earlier supine test seat and restraint harness for low-stress experiments using a squirrel monkey is included.

Air Force Missile Development Center, Holloman AFB, N. Mex.
THE ACCELERATION RATE OF ONSET PROBLEM IN SIMPLE LINEAR SYSTEMS, by Thomas P. Rona (Mass. Inst. of Tech.). July 59, 26p. 2 refs. AFMDC-TN-59-21.
Order from LC mi$2.70, ph$4.80 PB 142 846

The experimental evidence that the rate of acceleration onset is one of the critical factors in damage sustained by living organisms is discussed from the viewpoint of Applied Mechanics. It is shown that such evidence is insufficient to form a rational basis of design. The effect of rate of acceleration onset is then computed for a few simple models. The strain within these models is easily shown to depend on the first derivative of the acceleration rather than just on acceleration alone.

Air Force Missile Development Center, Holloman AFB, N. Mex.
AIRBORNE GALVANIC SKIN RESPONSE STUDIES: A PRELIMINARY REPORT, by Grover J. D. Schock. June 59, 12p. 3 refs. AFMDC TN-59-14; AD-215 465.
Order from LC mi$2.40, ph$3.30 PB 142 965

Preliminary data show the galvanic skin response (GSR) of human subjects to be unaffected by weightlessness per se. GSR data indicate changes are due to emotional factors such as anxiety.

Air Force Missile Development Center, Holloman AFB, N. Mex.
PERCEPTION OF THE HORIZONTAL AND VERTICAL IN SIMULATED SUBGRAVITY CONDITIONS, by Grover J. D. Schock. June 59, 17p. 3 refs. AFMDC TN-59-13; AD-215 464.
Order from LC mi$2.40, ph$3.30 PB 142 966

Quantitative experiments show that in simulated subgravity conditions with decreased proprioceptive input, perception of the horizontal and vertical is greatly impaired. During actual space flight artificial gravity forces may be needed to insure adequate human orientation during weightlessness.

Air Force Missile Development Center, Holloman AFB, N. Mex.
A STUDY OF ANIMAL REFLEXES DURING EXPOSURE TO SUBGRAVITY AND WEIGHTLESSNESS, by Grover J. D. Schock. June 59, 18p. 6 refs. AFMDC TN-59-12; AD-215 463.
Order from LC mi$2.40, ph$3.30 PB 142 967

Normal cats exposed to weightlessness display loss of labyrinthine reflexes, disorientation and confusion, with and without visual cues. Cats in which the vestibular cortical area of the brain had been removed bilaterally seem to be less disoriented and confused than normal animals, but also display loss of labyrinthine reflexes. Bi-labyrinthectomized cats, however, are relatively unaffected by exposure to weightlessness and display no symptoms of serious disorientation and confusion. (Author)

Audiology Lab., Northwestern U., Evanston, Ill.
SOME RELATIONS BETWEEN NORMAL HEARING FOR PURE TONES AND FOR SPEECH, by James F. Jerger and Raymond T. Carhart. Apr 59, 13p. 14 refs. AFSAM Rept. 59-43.
Order from LC mi$2.40, ph$3.30 PB 142 930

The results indicate that an intensity difference of 12-13 db between thresholds for a 1000 cps pure tone and for speech is approximately medial for normal-hearing subjects. It represents a value which might properly be selected as the relationship to be specified for audiometric standards.

Aviation Medical Acceleration Lab., Naval Air Development Center, Johnsville, Pa.
CALIBRATION OF AN AORTIC CIRCUMFERENCE GAUGE, by Richard W. Lawton and Carter C. Collins. Rept. no. 5 on Proj. NM 11 01 12.6. 19 Sep 58, 11p. 5 refs. NADC MA-5811.
Order from LC mi$2.40, ph$3.30 PB 139 227

Static and dynamic calibrations of short mercury-in-rubber aortic circumference gauges have been carried out. Amplitude and phase distortions above 10 cps suggest a radial resonance in the rubber tubing. Below this frequency amplitude and phase distortion is negligible. The gauge characteristics themselves do not account for the phase lead of the circumference over the pressure observed by Rushmer in the aortic arch.

Aviation Medical Acceleration Lab., Naval Air Development Center, Johnsville, Pa.
ELASTIC CHARACTERISTICS OF ISOLATED SEGMENTS OF HUMAN AORTAS UNDER DYNAMIC CONDITIONS, by Freeman W. Cope. Rept. no. 5 on Proj. NM 11 01 12.6. 13 Aug 58, 17p. 10 refs. NADC-MA-5809.
Order from LC mi$2.40, ph$3.30 PB 142 580

When isolated segments of human descending thoracic aorta were caused to change their volume rapidly and continuously in sinusoidal fashion with pulse pressures and pulse rates maintained in the physiological range, the resulting pressure-volume curves showed slight but consistent increases in stiffness, compared to pressure-volume curves obtained on the same specimens when inflated stepwise. There was introduced into the pressure measuring system a time lag of sufficient magnitude to eliminate the hysteresis loop. The extent of hysteresis in the aorta was not determined because time lags in the aorta could not be distinguished from time lags in the measuring equipment.

Radiobiological Lab., U. of Texas, Austin.
RESPONSE OF RHESUS MONKEYS TO PROBALISTIC SEQUENTIAL DEPENDENCIES, by John E. Overall and W. Lynn Brown. Feb 59, 5p. 15 refs. AFSAM Rept. 59-3.
Order from LC mi$1.80, ph$1.80 PB 142 925

Forty-nine rhesus monkeys were divided into two treatment groups of 24 and 25 animals. Two identical stimulus objects were presented at each trial in a Wisconsin General Test Apparatus with reward presented for an equal number of trials on the left and right sides. For one group, the sequence of reward placements contained a positive contingency; for the other group, it contained a negative contingency. The distribution of responses for sophisticated rhesus monkeys was found to depend on the statistical structure of the stimulus sequence.

Psycho-Acoustic Lab., Harvard U., Cambridge, Mass.
PERIODIC STATUS REPORT XXXI. Rept. for 16 Nov 57-15 May 58 on Contract Nonr-1866(15). 15 May 58, 15p. 54 refs. PNM-79.
Order from LC mi$2.40, ph$3.30 PB 138 819

See PB 136 697

Vision Research Labs., U. of Michigan, Ann Arbor.
THE EFFECTS OF PRACTICE ON THE VISUAL-DETECTION THRESHOLDS OF NAIVE OBSERVERS, by C. E. Hamilton. Rept. on Proj. Michigan, Contract DA 36-039-sc-52654. Nov 58, 14p. 5 refs. Rept. no. 2144-[327]-T.
Order from LC mi$2.40, ph$3.30 PB 142 800

This study is concerned with the effects of practice upon visual-detection thresholds obtained with the temporal forced-choice method. The effects of up to 10 sessions of initial practice were measured for a total of 19 observers, using targets varying in size from 2 to 64 minutes and with exposure durations varying from

0. 044 to 0. 5 second. The effects of initial practice have been found to be relatively small, averaging only between 20 to 30 percent, and relatively short-lived, being largely absent after the fourth practice session. The transfer effects of initial practice on one visual task on other tasks differed with respect to both target size and exposure durations. Improvement as a result of initial practice on a 2-minute target presented for 0. 044 second transferred completely to a 64-minute target presented for the same duration. On the other hand, initial practice on a 64-minute target presented for 0. 044 second failed to transfer at all to a 2-minute target presented for the same duration. When initial practice was given on a 2-minute target presented for a 0. 5-second duration, there was very little transfer to a 2-minute target presented for a 0. 044-second duration. These results have significance for both psychophysical threshold methodology and military observer training.

Vision Research Labs., U. of Michigan, Ann Arbor. EFFECTS OF TARGET SIZE AND SHAPE ON VISUAL DETECTION: I. CONTINUOUS FOVEAL TARGET AT MODERATE BACKGROUND LUMINANCE, by A. B. Kristofferson and H. R. Blackwell. Rept. on Proj. Michigan, Contract DA 36-039-sc-52654. Sep 58, 33p. 11 refs. Rept. no. 2144-279-T.
Order from LC mi$3. 00, ph$6. 30 PB 142 793

Target contrast for detection determined by the temporal forced-choice method has been measured for each of 60 continuous targets of uniform luminance at a background luminance of 9. 52 foot-lamberts, an exposure duration of 0. 010 sec, and with foveal target presentation. Targets varied in size from what were effectively point sources up to targets extending to the limits of the central fovea. Four general classes of target shape are included: circular, rectangular, multiple-legged and regular geometrical forms. As shape departs from circularity, detectibility decreases independently of target area. An empirical analysis in terms of target geometry reveals that three factors in addition to area are required to order the data. A theoretical analysis in terms of an element contribution theory reduces the error of prediction significantly over prediction on the basis of area alone. Two systematic departures from theoretical expectations are demonstrated. Additions to and extensions of the theory, on the basis of these and other data, are discussed briefly.

Vision Research Labs., U. of Michigan, Ann Arbor. THE MAGNITUDE OF THE PULFRICH STEREOPHENOMENON AS A FUNCTION OF TARGET THICKNESS, by Alfred Lit. Rept. on Proj. Michigan, Contract DA 36-039-sc-52654. Mar 59, 16p. 6 refs. Rept. no. 2144-387-T.
Order from LC mi$2. 40, ph$3. 30 PB 142 798

When filters of unequal optical density are placed in front of the two eyes, a target which is actually oscillating in a frontoparallel plane appears nearer than it really is for one direction of stroke and farther than it really is for the return stroke (Pulfrich stereophenomenon). Measurements of the near and far displacements of an oscillating black vertical rod are obtained as functions of (a) target thickness, (b) target velocity, and (c) condition of unequal binocular retinal illuminance. The experimental data show that variation in target thickness has no effect on the magnitude of the near and far displacements. Variations in target velocity and in condition of unequal binocular retinal illuminance produce characteristic effects which are shown to be in good quantitative agreement with predictions based on the geometrical theory of the Pulfrich stereophenomenon. Discrepancies at low target velocities are noted and discussed.

Vision Research Labs., U. of Michigan, Ann Arbor. RELATIONS BETWEEN VISIBILITY THRESHOLDS FOR SINGLE AND DOUBLE PULSES, by W. C. Clark and H. R. Blackwell. Rept. on Proj. Michigan, Contract DA 36-039-sc-52654. Apr 59, 33p. 60 refs. Rept. no. 2144-343-T.
Order from LC mi$3. 00, ph$6. 30 PB 142 796

The detectability of targets consisting of single light pulses of varying duration and of double light pulses of varying temporal separation was measured for seven observers. The data obtained verified the predictive adequacy of the temporal-contribution hypothesis, which postulates that each temporal element of a photic stimulus produces a pattern of neural activity spread out across time. This hypothesis uses double-pulse data to infer the function of the temporal-element contribution, which is then used to predict the relations between exposure duration and detection thresholds for single pulses. Both double-pulse and single-pulse data showed a characteristic not accounted for by the temporal-contribution function. For double-pulse targets presented for more than 0. 07 sec, detectability increased. However, this result was quantitatively predictable by probability summation. Double pulses separated by more than 0. 07 sec allowed an observer to detect the target by either of the two independent events represented by the two pulses. Thus, the neural activity aroused by the two pulses was broken by a cycling characteristic of the nervous system into a series of independent neural events suitable for probability summation. The light-adapted eye was found to be superior to the dark-adapted eye in detecting pulse interruption, but inferior in temporally summating photic energy.

Vision Research Labs., U. of Michigan, Ann Arbor. STUDIES OF DARK ADAPTATION FOR NORMAL BINOCULAR VISION, by H. R. Blackwell and O. M. Blackwell. Rept. on Proj. Michigan, Contract DA 36-039-sc-52654. Jan 59, 16p. 2 refs. Rept. no. 2144-345-T.
Order from LC mi$2. 40, ph$3. 30 PB 142 799

The dark adaptation process was measured in several experiments for observers using normal binocular vision. A dark adaptometer, patterned on the MacLaughlin Recording Dark Adaptometer, was used with a 0. 25° test target of white, red, and blue light. Measurements were made following a 500-second exposure to a 1000 foot-lambert preadaptation field. The foveal retina was studied, as were two peripheral locations in the visual field. The dark adaptation curves demonstrate the comparative sensitivity of foveal, 12° peripheral, and 15° peripheral locations for white, blue, and red test flashes. The known spectral response curves of rod and cone photoreceptive cells are used to

identify the receptors involved in various phases of the dark adaptation process for the various light stimuli studied at each of the retinal locations.

Vision Research Labs., U. of Michigan, Ann Arbor. A TEST OF THE PHYSICAL QUANTUM THEORY OF VISION USING FOVEALLY-PRESENTED RECTANGULAR TARGETS, by S. W. Smith, C. M. Cutchshaw and W. M. Kincaid. Rept. on Proj. Michigan, Contract DA 36-039-sc-52654. Dec 58. 14p. 9 refs. Rept. no. 2144-347-T.
Order from LC mi$2.40, ph$3.30 PB 142 797

A discussion of the implications of the physical quantum theory for predicting detection thresholds for rectangular targets is presented. Rectangular targets of three different constant dimensions (1, 8, and 64 minutes of arc) and a variable dimension ranging in smaller steps from 1 to 64 minutes of arc were presented foveally to four dark-adapted observers. The target exposure duration was 0.01 second. Detection threshold values were determined and plotted in logarithmic units of illuminance (foot-candles) at the eye against the logarithm of the variable dimension. A slope of zero for small values of log variable dimension and 1/2 for large values fitted the data well. This is consistent with a two-quanta hypothesis.

Vision Research Labs., U. of Michigan, Ann Arbor. VISUAL ACUITY FOR RECTANGULAR AREA LINE-GRATINGS WITH VARIOUS INCLINATIONS OF LINES AND RECTANGULAR AREA, by E. R. Harcum and H. R. Blackwell. Rept. on Proj. Michigan, Contract DA 36-039-sc-52654. Sep 58, 13p. 12 refs. Rept. no. 2144-319-T.
Order from LC mi$2.40, ph$3.30 PB 142 794

The results of an experiment investigating differences in visual acuity for line-grating test objects reveal that horizontal and vertical inclinations of the lines in the grating are more often reported correctly than diagonal inclinations of the lines. Conversely, with respect to the meridians along which the rectangular area gratings were presented, somewhat fewer errors were made along the diagonal meridians and somewhat more were made along the horizontal and vertical meridians. The line-grating test objects consisted of long narrow rectangular areas. Recognition accuracy for reporting the inclination of the lines was measured for different inclinations of the lines within the grating when the rectangular area was presented along different meridians. Four inclinations, for both lines and meridians, were studied, as follows: 0°, 45°, 90°, and 135° from horizontal. A striking additional effect was also found. For all inclinations of the rectangular area grating, greatest accuracy was found when the lines in the grating were parallel to the long axis of the rectangle. Least accuracy was found when the lines in the grating were perpendicular to the long axis of the rectangle. These results suggest that the resolution of the lines in a line-grating acuity test object is affected by at least three important factors other than the width and separation of the test lines.

Vision Research Labs., U. of Michigan, Ann Arbor. VISUAL RECOGNITION ALONG FOUR MERIDIANS OF THE VISUAL FIELD: PRELIMINARY EXPERIMENTS, by E. Rae Harcum. Rept. on Proj. Michigan, Contract DA 36-039-sc-52654. June 57, 28p. 9 refs. Rept. no. 2144-50-T.
Order from LC mi$2.70, ph$4.80 PB 142 792

Observers were required to reproduce linear patterns of nine filled and unfilled ellipses presented at angular inclinations on the frontal plane of 0°, 45°, 90°, and 135° from vertical. Fixation was on the center ellipse in two experiments. The targets were presented binocularly in a Gerbrands-modified Dodge tachistoscope with a background luminance of approximately 5 ft-L. Angular extent of the total pattern was 3.4°. An error of reproduction was counted when the observer failed to reproduce a filled ellipse or filled an open one. Errors in reproducing the pattern were found to increase slightly as inclination increased from 0° to 135° clockwise from horizontal. The data suggested a sinusoidal relation between mean errors and the orientation of the half-meridians on either side of the fixation point. Minimum errors occurred at about northwest and maximum at about southeast. Attempted explanation of the results was in terms of neural sets established by the observers' past reading experience.

Vision Research Labs., U. of Michigan, Ann Arbor. VISUAL RECOGNITION ALONG VARIOUS MERIDIANS OF THE VISUAL FIELD. XIII. LINEAR BINARY PATTERNS AT KNOWN ECCENTRICITIES, by E. Rae Harcum. Rept. on Proj. Michigan, Contract DA 36-039-sc-52654. Sep 58, 16p. 6 refs. Rept. no. 2144-316-T.
Order from LC mi$2.40, ph$3.30 PB 142 791

This report contains the results of an experiment in which targets consisting of linear patterns of blackened and open circles were presented in the frontal plane of the visual field at inclinations of 0, 45, 90, and 135° with respect to the horizontal meridian. The fixation point was varied in its location in five experimental conditions, so that it either bisected the targets or appeared just off either end of vertical and horizontal targets. The observers knew that, regardless of the location of the fixation point, the target centers always registered with the center of the visual field. In two experiments eight-element and ten-element targets were employed. (See also PB 142 790)

Vision Research Labs., U. of Michigan, Ann Arbor. THE USE OF THE OCULAR RESTING POTENTIAL (ORP) AS A MEASURE OF SMALL EYE MOVEMENTS, by O. T. Law and R. L. DeValois. Rept. on Proj. Michigan Contract DA 36-039-sc-52654. Dec 58, 16p. 25 refs. Rept. no. 2144-337-T.
Order from LC mi$2.40, ph$3.30 PB 142 795

In this experiment, a bioelectrical phenomenon, designated the ocular resting potential (ORP), has been utilized to measure small eye movements. The ORP is recorded by placing pairs of electrodes on the skin of the face around the eyeball. This phenomenon depends upon the existence of a polarity difference between the front (cornea) and the back (retina) of the eyeball, the well-known corneal-retinal potential. The ORP has been shown to be capable of recording horizontal eye movements as small as 0.5°, with high-gain a-c -- d-c amplifiers. The magnitude of the ORP (microvolts) has

been shown to be linearly related to the angular extent of horizontal eye movements at least as large as 15°. With two pairs of electrodes one can record the vertical and horizontal components of the ORP for complex eye movement. These components may be fed to the Y and X axes of the oscilloscope. This results in a two-dimensional display of complex eye movements. The oscilloscopic display seems to represent a most promising method for studying complex eye movements.

Vision Research Labs., U. of Michigan, Ann Arbor.
VISUAL RECOGNITION ALONG VARIOUS MERIDIANS OF THE VISUAL FIELD. XI. IDENTIFICATION OF THE NUMBER OF BLACKENED CIRCLES, by E. R. Harcum and H. R. Blackwell. Rept. on Contract DA 36-039-sc-52654. Dec 58, 17p. 9 refs. Rept. no. 2144-314-T.
Order from LC mi$2.40, ph$3.30 PB 142 789

In this experiment, linear binary target patterns were presented tachistoscopically at four inclinations on the frontal plane of the visual field, with each array passing the observer's point of fixation. The task for the observer was to estimate the number of blackened elements which appeared on either side of fixation. (See also PB 142 792)

Vision Research Labs., U. of Michigan, Ann Arbor.
VISUAL RECOGNITION ALONG VARIOUS MERIDIANS OF THE VISUAL FIELD. XII. ACUITY FOR OPEN AND BLACKENED CIRCLES, by E. Rae Harcum. Rept. on Proj. Michigan, Contract DA 36-039-sc-52654. Sep 58, 19p. 19 refs. Rept. no. 2144-315-T.
Order from LC mi$2.40, ph$3.30 PB 142 790

In this experiment the observer was required to indicate the half-meridian in which the target appeared. The small number of errors recorded was due to the size and contrast of the blackened circle targets: 20 minutes in diameter and near unity in contrast. (See also PB 142 789)

Washington U., Seattle. School of Medicine.
A RECORDING GAS FLOWMETER, by A. C. Young. Rept. on Contract AF 33(038)422. Dec 52, 6p. 1 ref. [AFSAM] Proj. no. 22-1301-0002.
Order from LC mi$1.80, ph$1.80 PB 143 314

A flowmeter is described which records instantaneous flow and minute volume. The range of the instrument is from 1/4 L/min. to 300 L/min. for instantaneous flow, and from 1/4 L/min. to 100 L/min. for average or integrated flow. The special features of the instrument are: (1) ease of cleaning, and (2) freedom from large errors when mucous or water are carried into the flowmeter.

Biochemistry

Chicago U., Ill.
STUDIES ON REGULATORY MECHANISMS OF CELLULAR METABOLISM, by Wright Adams. Rept. for 1 January - 31 October 57 on Contract Nonr-2121(04). 17 Mar 58, 2p.
Order from LC mi$1.80, ph$1.80 PB 139 175

Administrative report.

Clayton Foundation Biochemical Inst., U. of Texas, Austin.
DENTAL CHANGES INDUCED IN RATS BY PROLONGED EXPOSURE TO ADVERSE ENVIRONMENTS, by Norman O. Harris (School of Aviation Medicine), Roy B. Mefferd, and Salvatore R. Restivo. Dec 58, 9p. 22 refs. AFSAM rept. 59-9.
Order from LC mi$1.80, ph$1.80 PB 142 924

Histopathologic and chemical studies were made on teeth of four groups of rats following chronic exposure to varying environments of low (3°C.), neutral (24°C.), and high (35°C.) temperatures; or to reduced barometric pressure (380 mm. Hg) at these temperatures. Histologic changes were not seen in the ground control or cold groups. Altitude was associated with a disruption of the odontoblastic layer and with a loss of polarity. This effect was accentuated by superimposed cold. Heat counteracted some of these altitude effects, but caused ameloblastic changes. Chemically, the concentrations of calcium phosphate, and magnesium were reduced significantly in the altitude- and heat-exposed groups.

School of Aviation Medicine, Randolph AFB, Tex.
HUMAN PLASMA STEROID AND ELECTROLYTE CONCENTRATIONS BETWEEN 0800 AND 1600 HOURS, by John R. Prigmore, Ira L. Shannon, and Ralph P. Feller. Apr 59, 6p. 4 refs. Rept. 59-62.
Order from LC mi$1.80, ph$1.80 PB 142 926

Two venous blood samples were collected from each of 460 healthy young adult males, with a 4-hour interval between samplings. There was no consistent change in total 17-hydroxycorticoid levels between 0800 and 1600 hours. Very small yet statistically significant increases in plasma sodium were found following the 4-hour periods between samples. Potassium concentration increased in three of the five time groups, only two of these increases being significant.

School of Aviation Medicine, Randolph AFB, Tex.
HUMAN WHOLE SALIVA VOLUME, SODIUM, AND POTASSIUM UNDER PROLONGED MASTICATORY STIMULATIONS, by Ira L. Shannon and John R. Prigmore. Apr 59, 9p. 6 refs. Rept. 59-63.
Order from LC mi$1.80, ph$1.80 PB 142 927

By collecting and analyzing 40 consecutive small samples from individuals, it was shown that the electrolytes, sodium, potassium, and chloride, are not elaborated through the parotid gland in a constant fashion but that, rather, there is a great variation in concentration of these variables between consecutive samples.

School of Aviation Medicine, Randolph AFB, Tex.
THE SODIUM AND POTASSIUM CONCENTRATIONS OF THE SALIVA COMMONLY FOUND IN THE

FLOOR OF THE MOUTH, by Ira L. Shannon and John R. Prigmore. Mar 59, 5p. 4 refs. Rept. 59-47.
Order from LC mi$1.80, ph$1.80 PB 142 931

A method is presented for the micro-determination of sodium and potassium in human whole saliva. A total of 456 subjects was studied by the method described above, and the data resulting from this experiment are described by means, standard deviations, and correlation coefficients.

School of Aviation Medicine, Randolph AFB, Tex.
THE SODIUM AND POTASSIUM CONTENT OF THE SUBMAXILLARY GLANDS OF PILOCARPINE-TREATED WISTAR RATS, COTTON RATS AND CHINCHILLAS, by Ira L. Shannon and Robert A. Brooks. Apr 59, 5p. 3 refs. Rept. 59-65.
Order from LC mi$1.80, ph$1.80 PB 142 928

The effect of pilocarpine dosage on submaxillary gland sodium and potassium was determined in three separate experiments utilizing Wistar rats, cotton rats, and chinchillas. Mean sodium levels were in all instances significantly higher in the treater animals than in the controls while the reverse held true for gland potassium content. The Na/K ratio was consistently higher in the pilocarpine-treated groups. These results suggest that the source of sodium for the functioning gland greatly exceeds that of potassium.

School of Aviation Medicine, Randolph AFB, Tex.
SOME CONSIDERATIONS IN AGAR COLUMN DIFFUSION ANALYSES, by William G. Glenn. Feb 59, 7p. 22 refs. Rept. 58-134.
Order from LC mi$1.80, ph$1.80 PB 142 981

Studies with human serum albumin and the globulin fraction of pooled homologous rabbit antiserum indicate that, by direct photometry of agar column reactions (Oudin type), zone density is inversely related to antigen as well as antibody concentration. This change appears to parallel the extension of the antigen concentration gradient down the column. The addition of nonspecific substances to human serum albumin increases the density of zones in agar columns, and removal of the albumin from rabbit antiserum decreases the zone density. Antigen plus antibody concentrations for entire diffusion patterns and individual precipitin zones may be obtained by removing the appropriate areas and analyzing them by the micro-Kjeldahl method. This makes it possible to measure the reactivity of a mixture of precipitin systems.

Botany

Academy of Natural Sciences of Philadelphia, Pa.
RESEARCH ON THE CHEMISTRY OF ALGAE, by Eva M. Low. Final rept. for 1 Dec 55-28 Feb 58 on Contract Nonr-1802(00). 28 Feb 58, 6p.
Order from LC mi$1.80, ph$1.80 PB 139 177

The following algae were studied: the fresh-water diatoms Navicula pelliculosa and Nitzschia palea; the marine diatom Cylindrotheca gracilis; the fresh-water bluegreen alga Anacystis nidulans and the fresh-water green alga Chlorella pyrenodosa. For all species nucleic acids were isolated and purines and pyrimidines determined.

California U., Los Angeles.
STUDIES ON PHAGES OF NOCARDIA AND PHAGE TYPING OF NOCARDIA SPECIES, by Orda A. Plunkett. Final rept. for 1 Apr 54-31 Mar 56 on Contract Nonr-233(25). [1956] 23p. 17 refs.
Order from LC mi$2.70, ph$4.80 PB 138 915

Microbiology

Aero Medical Lab., Wright Air Development Center, Wright-Patterson AFB, Ohio.
INFLUENCE OF STAPHYLOCOCCAL ENTEROTOXIN ON INFLUENZA VIRUS INFECTIVITY IN THE EMBRYONATED EGG, by William F. Hill and Charles M. Cox. Rept. on Health Hazards of Materials and Radiation. May 59, 17p. 8 refs. WADC Technical rept. 59-117.
Order from OTS $0.50 PB 151 973

The influence of treating embryonated eggs with "cat positive" staphylococcal enterotoxin filtrate on the infectivity of PR8 influenza virus is described. (The production of the enterotoxin is also described.) This study was undertaken in an attempt to elucidate additional properties of staphylococcal enterotoxin whereby new avenues of approach might lead to developing simple and precise methodology for detecting this toxin in suspect food. Available assay procedures lack definitive reliability in that they are either indirect or one-sided. The results of this study indicate that pre- and post-treatment of embryonated eggs with "cat-positive" enterotoxin filtrate exerts an inhibitory influence upon virus infectivity. A statistically significant difference at the 0.05 probability level was found between the mean EID_{50} of enterotoxin-treated and control groups of embryonated eggs. The particular mechanism whereby staphylococcal enterotoxin antagonizes virus infectivity remains obscure at present, but probably involves the alteration of host-cell metabolism.

DuMont, Allen B., Labs., Inc., Clifton, N. J.
AUTOMATIC COLONY COUNTER DEVELOPMENT, by G. Thomas. 18 Dec 56, 188p. 21 refs. Final rept. MO-3268.
Order from LC mi$8.10, ph$27.30 PB 138 869

This report describes, in detail, the principles of operation of circuits and optical system and operating and maintenance procedure of the Automatic Colony Counter. A complete set of all original drawings, including schematic drawings, fabrication and assembly drawings, standard components, etc., supplementary to this report have been delivered to the Chemical Corps at Fort Detrick, Md.

Hahnemann Medical Coll., Philadelphia, Pa.
VARIATION IN INFLUENZA VIRUSES, by B. A. Briody. Final rept. on Contract Nonr-1041(00). Apr 58, 3p. 8 refs.
Order from LC mi$1.80, ph$1.80 PB 139 361

Adaptation of influenza virus to mice is accompanied by the following changes in the virus: Acquisition of an accelerated growth curve. Ability to produce extensive pulmonary consolidation in 4 days. Resistance to beta-inhibitor.

Johns Hopkins U., Baltimore, Md.
ANTIGENIC STUDIES IN INFLUENZA VIRUS, by Thomas G. Ward. Technical rept. no. 1 (Final) for 1 July 50-30 June 56 on Contract Nonr-248(15). [1956] 7p. AD-124 482.
Order from LC mi$1.80, ph$1.80 PB 138 911

Long Island Biological Association, Cold Spring Harbor, N. Y.
GENETIC STUDIES ON MICROBIAL RESISTANCE TO CHEMICAL AND PHYSICAL AGENTS, by Ellis Englesberg. Final rept. on Contract Nonr-1154(01). 31 Mar 58, 44p. 28 refs.
Order from LC mi$3.30, ph$7.80 PB 139 249

It was with the purpose of elucidating some of these problems that a study was undertaken several years ago with Pasteurella pestis, strain A1122B1. This organism presented two advantages required for such a study: (1) The growth factor requirements of this strain were representative of the "species," (2) The requirements are sufficient for a varies analysis and yet not too complex to make experimental procedures unwieldy.

Pittsburgh U., Pa.
BIOPHYSICAL INVESTIGATIONS ON BACTERIOPHAGES, by Irwin Bendet and Max A. Lauffer. Technical rept. no. 5, 1 Jan-31 Dec 57, on Contract Nonr-624(03). [1957] 6p. 3 refs.
Order from LC mi$1.80, ph$1.80 PB 138 645

Work has been continued toward the ultimate solution of the following problems: (1) Explanation of the dual sedimentation phenomenon manifested by T2 bacteriophage. (2) Determination of the hydration associated with the bacterium Escherichia coli. (3) Biophysical characterization of the bacterial virus T3.

Pathology

Army Chemical Warfare Labs., Army Chemical Center, Md.
DEVELOPMENT OF A DISEASE-FREE RAT COLONY WITH SPECIAL REFERENCE TO CHRONIC RESPIRATORY DISEASES. I, by M. A. Ross, C. E. Wilson, and D. R. Gletfelty. Technical rept. for Oct 57-June 58 on Pathological Action of CW Agents. Sep 58, 24p. 8 refs. CWLR 2242.
Order from LC mi$2.70, ph$4.80 PB 139 141

This report covers what is termed phase I of the program to establish a colony of rats free of the pulmonary disease complex. Initial breeding stock was found to harbor the disease entity of otitis media in 11.8% of the animals; diagnosis was based upon gross examination and bacteriological culture procedures. Young stock from infected breeders were found to be grossly infected as early as 31 days of age which indicated that otitis is a more acute disease than generally believed. The methods of diagnosis, breeding practices, and care of colony are discussed.

Boston U. School of Medicine, Mass.
PHARMACOLOGIC CONTROL OF HYPOTHERMIC VENTRICULAR FIBRILLATION, by Albert H. Hegnauer and Evangelos T. Angelakos. Rept. on Physiology of Flight, Contract AF 33(616)3805. May 59, 67p. 90 refs. WADC Technical rept. 59-125.
Order from OTS $1.75 PB 161 050

Investigation has been made into pharmacologic control of hypothermic ventricular fibrillation (VF). Two tests were employed for evaluation of antiarrhythmic activity: one against spontaneous VF during progressive cooling and the other against VF during ventriculotomy at 26°C. with circulatory stasis. Results indicate that activity in each of these two tests may depend upon different pharmacologic effects. More than 30 compounds were tested. The nine most promising were tested more rigorously. Quinidine, effective in preventing spontaneous VF and in lowering mean lethal temperature, was made the standard of reference for evaluating other compounds. Certain antihistaminics were found more effective, while doxylamine and antergan were found approximately equal to quinidine in effectiveness. In experimental hypothermic ventriculotomy with controlled pH and inflow occlusion, quinidine, antazoline, and chloromethapyrilene exhibited definite antifibrillatory action, with survival limited by development of acute heart failure. The latter could be surmounted by administering inotropic agents. Ouabain did not alter the incidence of hypothermic VF.

Illinois U. Coll. of Medicine, Chicago.
CHOLESTEROL METABOLISM, by A. C. Ivy. Final rept. for 1 Oct 55-30 Sep 56 on Contract AF 18(600)1580. 1 Apr 57, 23p. 9 refs. AFOSR TR-57-30; AD-126 468.
Order from LC mi$2.70, ph$4.80 PB 138 921

This study was primarily undertaken to study in man the effect of palmitic and stearic acid on the intestinal absorption of cholesterol in man and to determine the effect of these fatty acids and nicotinic acid on the development of atherosclerosis in the chicken.

Naval Ordnance Test Station, China Lake, Calif.
A STUDY OF TRACE IMPURITIES IN AVIATORS' BREATHING OXYGEN, by Charles M. Drew, Richard L. Schowen, and S. Ruven Smith. 3 Feb 58, 31p. 6 refs. NOTS-1887; NAVORD rept. 5809.
Order from LC mi$3.00, ph$6.30 PB 139 303

A study of aviators' breathing oxygen from pressure and liquid apparatus has been carried out to determine

the impurities that are responsible for nausea and anoxiation reported by some pilots. An analytical method using gas chromatography and mass spectrometry has been used to determine the identity and concentration of the contaminants in the breathing oxygen. A possible mechanism whereby these contaminants affect the pilots has been proposed and recommendations to purify the breathing oxygen have been made.

Rochester U. School of Medicine and Dentistry, N. Y.
ACCELERATION OF BURN AND WOUND HEALING WITH TRACE ELEMENTS, by W. H. Strain. A. M. Dutton and others. Progress rept. for 1 Jan 55-31 Dec 56 on Contract N6onr-241(11). [1956] 72p. 21 refs.
Order from LC mi$4.50, ph$12.30 PB 142 904

The acceleration of healing in rats by feeding minute amounts of zinc compounds has been attributed to the correction of a trace element deficiency in the diet. This has suggested the possibility of other trace element deficiencies and raised the question of the ideal trace element mixture. (See also PB 123 792)

Washington U. School of Medicine, St. Louis, Mo.
STUDIES OF FACTORS CONSIDERED RESPONSIBLE FOR DISEASES OF THE EXTERNAL EAR: INFLUENCE OF TEMPERATURE AND HUMIDITY ON ETHER-SOLUBLE SUBSTANCES IN EXTERNAL AUDITORY CANAL, by Elizabeth S. Baumann, Carl F. Gessert and Ben H. Senturia. Sep 58, 10p. 32 refs. AFSAM rept. 58-112.
Order from LC mi$1.80, ph$1.80 PB 139 139

Measurements were made of the amounts of ether-soluble substances (ESS) in the external auditory canals of cats and rabbits kept under controlled conditions of high relative humidity and low temperature with low relative humidity. The quantity of ESS found in the ear canals of cats or rabbits did not differ significantly with differences in environmental temperature and humidity. (See also PB 139 138)

Washington U. School of Medicine, St. Louis, Mo.
STUDIES OF FACTORS CONSIDERED RESPONSIBLE FOR DISEASES OF THE EXTERNAL EAR: SURVIVAL OF EXOGENOUS ORGANISMS IN THE EXTERNAL AUDITORY CANAL UNDER VARIED CONDITIONS, by Charles D. Carr and Ben H. Senturia. Sep 58, 18p. 56 refs. AFSAM rept. 58-111.
Order from LC mi$2.40, ph$3.30 PB 139 138

The endogenous bacterial flora of the cat meatus was found to be similar to that of the normal human ear canal. Exposure of the cat to elevated or lowered temperatures and humidities did not alter the flora nor produce any morphologic changes in the skin of the ear canal. Morphologic changes were produced in the skin of susceptible cat ears by the instillation of Pseudomonas aeruginosa under the controlled environmental conditions, and the contaminant was shown to persist in the ear for long periods, apparently independent of the concentration of bacteria instilled. Exogenous gram-negative bacilli survived for longer periods than did exogenous gram-positive bacteria. Additional factors of trauma and lipid removal did not appear to have a striking influence on the survival time of instilled organisms, nor on the degree of morphologic skin changes. (See also PB 139 139)

Pharmacology and Toxicology

Army Chemical Warfare Labs., Army Chemical Center, Md.
THE EFFECT OF RYANODINE ON ATP-CREATINE-TRANSPHOSPHORYLASE, by David L. Hill, Masao Ueda and John White. Aug 58, 5p. 5 refs. CWL Technical memo. 23-8.
Order from LC mi$1.80, ph$1.80 PB 138 788

The effects of varying concentration and experimental conditions of ryanodine on the enzyme are given. Tables and references included.

[Army Chemical Warfare Labs.] Army Chemical Center, Md.
THE TOXICITY OF A 50-50 SANTOCEL-PARAOXON AEROSOL TO RATS BY INHALATION, by Hans J. Trurnit and Frank J. Vocci. Feb 51, declassified 16 Apr 56, 18p. 8 refs. Medical Div. Research rept. 42.
Order from LC mi$2.40, ph$3.30 PB 139 571

A series of experiments was conducted in which rats were exposed to aerosols of a 50-50 mixture of Santocel and Paraoxon. An approximate LCt50 was estimated. Symptoms were noted and pathology described. Particle size counts were made.

School of Aviation Medicine, Randolph AFB, Tex.
SOME EFFECTS OF CHLORPROMAZINE ON ACTIVITY, by D. W. Tyler, Benjamin D. Fremming and others. Apr 59, 6p. 4 refs. Rept. 58-150.
Order from LC mi$1.80, ph$1.80 PB 142 929

This study is the second of a series which is designed to determine the activity level of the rhesus monkey under various doses of certain tranquilizing drugs. Six rhesus monkeys were used in the determination of activity level as a consequence of various dosages of chlorpromazine. A negative linear decreasing relationship betwen amount of dose and over-all activity was obtained. In general it was also found that dosing with chlorpromazine yields a somewhat more predictable effect than does reserpine administration.

Radiobiology

Radiobiological Lab., U. of Texas, Austin.
RUNNING WHEEL ACTIVITY OF RATS TESTED UNDER VARYING CONDITIONS OF FOOD DEPRIVATION THIRTY-THREE DAYS AFTER ACUTE EXPOSURE TO 1,050 R OF GAMMA RADIATION, by A. A. McDowell and W. Lynn Brown. Mar 59, 4p.

5 refs. AFSAM rept. 58-143.
Order from LC mi$1.80, ph$1.80 PB 142 932

Four normal and five acutely irradiated male Sprague-Dawley rats, all of the same age, were compared with respect to running wheel activity under four food deprivation schedules introduced in the following order: (a) 4 days of total food deprivation; (b) 20 days of 23-hour food deprivation; (c) 4 days of total food deprivation; and (d) 5 days of ad libitum feeding. Irradiates were compared with controls 33 days following acute exposure to 1,050 r of Co^{60} gamma radiation. The following results were obtained: (1) The mean running wheel activity for the animals of the normal group over the four deprivation schedules was significantly greater than that for the animals of the irradiated group. (2) Running wheel activity varied significantly with deprivation schedules. (3) The interaction between groups and deprivation schedules was significant. (4) A significantly greater gain in running wheel activity during the second than during the first 4-day period of total food deprivation was noted.

Radiobiological Lab., U. of Texas, Austin.
TRANSFER BY NORMAL AND CHRONIC FOCAL-HEAD IRRADIATED MONKEYS OF A SINGLE LEARNED DISCRIMINATION ALONG A PERIPHERAL CUE GRADIENT, by A. A. McDowell and W. Lynn Brown. Feb 59, 4p. 2 refs. AFSAM rept. 59-18.
Order from LC mi$1.80, ph$1.80 PB 142 923

Nine normal monkeys, three monkeys with previous focal-head irradiation of the posterior association areas, and two monkeys with previous focal-head irradiation of the frontal association areas were tested for transfer of a simple learned discrimination along a peripheral cue gradient. The results of the study demonstrated that: (1) There was no significant difference in performance between normal and chronic focal-head irradiated monkeys. (2) There was a significant change in performance as a function of degree of spatial separation between the relevant discriminanda and site of food reward.

CHEMISTRY

Battelle Memorial Inst., Columbus, Ohio.
RESEARCH ON THERMOSTABLE MOLECULES AND POLYMERS, by Emil A. Lawton and Donna D. McRitchie. Rept. for 10 Mar 56-30 Nov 57 on Contract AF 33(616)3477. Nov 57, 92p. 71 refs. WADC Technical rept. 57-642; AD-142 199.
Order from OTS $2.25 PB 131 663

The yields of reactions for the preparation of phthalocyanines showed that polybenzotetraazaporphins could best be prepared using either o-phthalonitrile and pyromellitic tetranitrile with metal alkoxides or diiminoisoindoline and tetraiminopyromellitic diimide. Considerable difficulty was experienced in preparing pyromellitic tetranitrile. Various copper polybenzotetraazaporphins were prepared. Copper phthalocyanine, metal-free phthalocyanine, and polybenzotetraazaporphins are unaffected by exposure to 10^8 rep in a Co-60 source. Also, the conductivity of pressed copper phthalocyanine was about 100 times greater than previously observed for this compound.

Instituto de Quimica Fisica, Madrid (Spain).
KINETICS AND MECHANISM OF THE DEHYDROGENATION OF ISO-PROPYL ALCOHOL ON Cr_2O_3, by J. F. García de la Banda and G. Kremenić Orlandini. Technical note no. 1 on Contract AF 61(514)1330. Nov 58, 57p. 37 refs. AFOSR TN-59-36; AD-209 208.
Order from LC mi$3.60, ph$9.30 PB 138 709

The kinetics of the reaction of dehydrogenation of isopropyl alcohol on Cr_2O_3 at 350, 380, 410, 440, 470 and 500°C has been studied, using a differential reactor. Reacting mixtures of isopropyl alcohol and acetone with 100, 90, 80, 70 and 60 molar percentage of isopropyl alcohol have been used.

Johns Hopkins U., Baltimore, Md.
MECHANISMS OF ISOTOPIC EXCHANGES IN THE BORON HYDRIDES, by Walter S. Koski. Technical note no. 11 on Contract AF 18(600)1526. June 59, 20p. 12 refs. AFOSR TN-59-613; AD-217 400.
Order from LC mi$2.40, ph$3.30 PB 142 986

The exchange of deuterium and B^{10} between diborane and several of the more common boron hydrides has been studied with the expectation that a knowledge of the exchange mechanism will give a better insight into the nature of the intermediate fragments that play an important role in the chemistry of these compounds.

Milano U. (Italy).
STUDY OF IRIDIUM COMPOUNDS, by Lamberto Malatesta. Technical note no, 1 on Contract AF 61(052)83. 31 Oct 58, 36p. 4 refs. AFOSR TN-59-123; AD-210 428.
Order from LC mi$3.00, ph$6.30 PB 138 718

The previously unknown potassium bromocarbonyliridiates have been prepared from the reaction of carbon monoxide with K_2IrBr_6 at high pressure. The mode of formation and the possible structure of these compounds, and of their analogous ones are discussed. From the reaction of these chloro and bromocarbonyl-derivatives with amines, the very stable non electrolytic iridium(I) derivatives $Ir(CO)_2$(Amine) Cl and $Ir(CO)_2$(Amine)Br have been prepared and are described.

Naval Research Lab., Washington, D. C.
REACTIONS OF ORGANOPHOSPHORUS ACIDS WITH ISOCYANATES. PART II. CONDENSATIONS IN THE ABSENCE OF BASES, by R. B. Fox. Interim rept. 25 Aug 59, 10p. 6 refs. NRL rept. 5365.
Order from OTS $0.50 PB 151 809

An investigation of the reactions of some organophosphorus acids with isocyanates in the absence of added bases has been carried out. In contrast to the base-catalyzed reaction with isocyanates in which a normal condensation of weakly acidic hydrogen-containing groups gives the corresponding carbamoyl

derivatives, the main reaction in the absence of added bases is that of dehydration with the formation of P-O-P linkages. Both phenylphosphinic acid and phenylphosphonic acid react at room temperature with phenyl isocyanate to yield the same product, dianilinium diphenylphyrophosphonate, which is also formed from phenylphosphonic acid and diphenylurea or methyl carbanilate at 210°. The salt is readily converted to the known diphenylpyrophosphonic acid.

Nepa Div., Fairchild Engine and Airplane Corp., Oak Ridge, Tenn.
REPORT ON URANIUM DIOXIDE, by John J. Neely. 15 Sep 47, declassified 31 Jan 57. 47p. 89 refs. [NEPA 355-EMR-18] Rept. no. NEPA 5.
Order from LC mi$3.30, ph$7.80 PB 143 042

This is the first of a series of material survey reports dealing with the various oxides of uranium, and as such is a compilation of information at present available on this project. No attempt has been made to correlate or evaluate in cases where conflicting data from various sources is presented.

Notre Dame U., Ind.
ACTION OF SULFURIC ACID ON SATURATED ALIPHATIC HYDROCARBONS, by Kenneth N. Campbell and William E. Erner. Final rept. on Contract N7onr-439, T.O. 1. 9 Aug 50, 38p. 19 refs. ATI-86 677.
Order from LC mi$3.00, ph$6.30 PB 143 310

This study on saturated aliphatic hydrocarbons was undertaken to investigate the reaction of isoparaffins with sulfuric acid in some detail. This was done to determine the structural requirements for such reaction, and to identify the products formed. Specific hydrocarbons that are used are listed, and their physical constants are shown in tabular form. A Podbielniak hyper cal column was used for most of the fractional distillations; and spectrograms were employed in identification work. Four main effects observed were isomerization, hydrogen-exchange with the acid, racemization, and formation of saturated hydrocarbons of lower and higher molecular weight than the original. Among the factors discussed are reaction rates, induction period before the acid begins to darken, structure effects on ease of reaction, reaction products, and mechanism, of reaction.

Pennsylvania U., Philadelphia.
THE INTERACTION OF BORON HALIDES WITH SILYL CYANIDES, by E. Charles Evers, Walter O. Freitag and others. Technical rept. no. 4 on Contract Nonr-551(21). 27 Oct 58, 12p. 23 refs.
Order from LC mi$2.40, ph$3.30 PB 143 048

The interaction of boron halides with silyl cyanide or trimethylsilyl cyanide leads to the adducts $R_3SiCN \cdot BX_3$, where R is hydrogen or a methyl group, and X is halogen. When the adducts are heated, R_3SiX is eliminated leaving BX_2CN as residue. The latter undergoes further decomposition producing BX_3 and a black residue of composition BC_3N_3.

[Material Lab.] New York Naval Shipyard, [Brooklyn].
DEVELOPMENT OF APPARATUS AND METHODS FOR CHEMICAL AND ELECTROCHEMICAL SPOT TESTING TITANIUM IN STAINLESS STEELS. Final rept. 3 Oct 57, 3p. Lab. Project 5871-4; AD-150 462.
Order from LC mi$1.80, ph$1.80 PB 139 162

A method of spot testing for titanium by use of chromotropic acid reagent is presented.

North Carolina U., Chapel Hill.
NEW CHELONS BASED ON PYRIDINE, by Dave C. Priest, Fawzy S. Sadek and others. Technical note on Contract AF 18(600)1160. Feb 59, 7p. 7 refs. UNC-Chem. no. 22-CNR; AFOSR TN-59-172; AD-211 112.
Order from LC mi$1.80, ph$1.80 PB 142 890

Recently the proposal of new chelons (other than the classical EDTA) has permitted many selective titrations. Thus, for example, the polyamines permit selective titrations of the latter transition metals and EGTA (the titration of calcium in the presence of magnesium). Another class, derivatives of 2-aminoethyl pyridine-N-N-diacetic acid (PADA) have been synthesized, and the results of the 6-methyl derivative are described in this study. Unlike EDTA, the 6-methyl PADA does not form stable complexes with the alkaline earths and rare earths, that is otherwise similar. Unlike the polyamines, the 6-methyl PADA reacts with lead and bismuth in acid solution. In this

North Carolina U., Chapel Hill.
SELECTIVE POTENTIOMETRIC TITRATION OF METAL IONS WITH TRIETHYLENE-TETRAMINE, by Charles N. Reilley and Mary V. Sheldon. Rept. on Contract AF 18(600)1160. Feb 59, 21p. 13 refs. UNC-Chem. no. 21-CNR; AFOSR TN-59-170; AD-211 040.
Order from LC mi$2.70, ph$4.80 PB 142 892

The theoretical conditions necessary for the potentiometric titration of metal ions with triethylenetetramine ("trien") and for the selective titration of mixtures of ions with this reagent, alone or in conjunction with EDTA, are discussed. It is shown that it is possible to choose conditions suitable for selective titrations, and this is illustrated by titrations of Cu, Zn, Ni, Cd, and Hg, singly and in two-component mixtures. Alkaline earths do not interfere in the titrations.
laboratory a number of new chelons based upon pyridine have recently been synthesized and are under current investigations. These may be designated as derivatives of 2-aminomethyl pyridine-N-N-diacetic acid (abbreviated PADA).

North Carolina U., Chapel Hill.
TETRAETHYLENEPENTAMINE, 'TETREN', A SELECTIVE TITRANT FOR METAL IONS. POTENTIOMETRIC END POINT DETECTION, by Charles N. Reilley and Alexander Vavoulis. Technical note on

Contract AF 18(600)1160. Feb 59, 23p. 13 refs. UNC-Chem. no. 20-CNR; AFOSR TN-59-171; AD-211 104.
Order from LC mi$2.70, ph$4.80 PB 142 891

Theoretical and practical considerations demonstrate that tetraethylenepentamine, as a selective titrant for metal ions, is superior to triethylenetetramine. The extent of reaction of tetraethylenepentamine with mercury, copper, nickel, zinc, and cadmium is discussed quantitatively in relation to the effect of pH, complex formation, and hydrolysis. Potential-pH diagrams obtained using a mercury electrode offer a simple means of predicting desirable titration conditions and for detecting the relative effect of the various competitive equilibria involved. Titrations of mercury, copper, nickel, zinc, and cadmium alone and in various mixtures were effected using the mercury electrode for potentiometric end point detection. The alkaline earths, rare earths, aluminum, bismuth, lead, and scandium do not interfere. Mercury and copper can be titrated at low pH in the presence of nickel, zinc, or cadmium. In combination with EDTA, a large number of metal ions in multicomponent mixtures may be readily estimated.

Inorganic Chemistry

[Army] Engineer Research and Development Labs., Fort Belvoir, Va.
PROPERTIES, OXIDATION, DECOMPOSITION, AND APPLICATION OF THIN FILMS OF SILICON MONOXIDE, by Georg Hass. 7 Sep 50, 30p. 17 refs. Rept. 1180.
Order from LC mi$2.70, ph$4.80 PB 143 502

In spite of the extensive literature published on silicon monoxide, very little is known in regard to the oxidation rates of silicone monoxide in air at various temperatures, its decomposition at high temperatures, and the effect of the speed of evaporation on the condensate formed. The present paper presents data on these reactions and phenomena, which have a great influence on the properties and behavior of vacuum-deposited silicon monoxide films and discusses the application of these films for electron microscope and electron diffraction studies.

Cryogenic Lab., Ohio State U. Research Foundation, Columbus.
THE VAPOR PRESSURE OF INORGANIC SUBSTANCES. VII. IRON BETWEEN 1356°K AND 1519°K AND COBALT BETWEEN 1363° K AND 1522° K, by James W. Edwards, Herrick L. Johnston, and Walter E. Ditmars. Technical rept. no. 9 on Vapor Pressure of Metals and Metal Oxides, Contract N6onr-225, T. O. 1. 21 Mar 51, 16p. 6 refs. TR-281-9; ATI-107 836.
Order from LC mi$2.40, ph$3.30 PB 143 212

The vapor pressures of iron and cobalt have been determined by the vacuum evaporation method introduced by Langmuir. Heats of sublimation at the Absolute Zero have been calculated and equations formulated for vapor pressure as a function of temperature. The condensation (accommodation) coefficient has been found to be unity.

Horizons, Inc., Cleveland, Ohio.
STUDIES ON RARE EARTH CARBIDES: II, by R. C. Vickery, R. Sedlacek, and Ardys Ruben. Technical note no. 2 on Contract AF 49(638)80. 17 July 58, 7p. 6 refs. AFOSR-TN-58-594; AD-162 118.
Order from LC mi$1.80, ph$1.80 PB 138 751

Paramagnetism of tervalent rare earth ions is shown to be affected only to a minor degree upon carbide formation.

Nepa Div., Fairchild Engine and Airplane Corp., Oak Ridge, Tenn.
REPORT ON LITHIUM CARBIDE, by Mary Ann Hyla. 13 Feb 48, declassified 15 Apr 48. 22p. 11 refs. NEPA 409 EMR-23; AD-204 944.
Order from LC mi$2.70, ph$4.80 PB 138 944

Nepa Div., Fairchild Engine and Airplane Corp., Oak Ridge, Tenn.
REPORT ON TANTALUM, by Raymond Eugene Tate. 13 Feb 48, 42p. 52 refs. NEPA 407-EMR-21; AD-204 915.
Order from LC mi$3.30, ph$7.80 PB 138 946

Rensselaer Polytechnic Inst., Troy, N. Y.
MOLTEN CARBONATES; BIBLIOGRAPHY AND LITERATURE REVIEW FOR LITHIUM, SODIUM, POTASSIUM CARBONATES, by Max R. Lorenz and George J. Janz. Technical rept. no. 1 on Contract Nonr-591(10). Sep 58, 77p. 96 refs. AD-208 648.
Order from OTS $2.00 PB 151 991

This technical report gives an assessment of the status of knowledge for three of the alkali metal carbonates. The high reactivity of molten carbonates and the subsequent experimental problems undoubtedly contribute, in part, to the rather limited data and the lack of quality in many instances for the work accomplished. Further research in almost all the areas is required to meet the need for fundamental information required to interpret physico-chemical and electrochemical processes in molten carbonates.

Rensselaer Polytechnic Inst., Troy, N. Y.
THERMOGRAVIMETRIC AND CORROSION STUDIES AND PHASE EQUILIBRIA FOR LITHIUM, SODIUM AND POTASSIUM CARBONATES, by Max R. Lorenz and George J. Janz. Technical rept. no. 2 on Contract Nonr-591(10). Oct 58, 27p. 14 refs.
Order from LC mi$2.70, ph$4.80 PB 143 220

Results of thermogravimetric studies on lithium and potassium carbonate in vacuum and in an atmosphere of CO_2 up to 600°C are reported. Corrosion studies including tests on platinum, silver, gold, boron nitride and single crystals of magnesium oxide are described. A report on studies in progress of the phase equilibria for the ternary system Li_2CO_3-

Na_2CO_3 - K_2CO_3 is given together with the equilibrium diagrams for the three possible sets of binary mixtures for these carbonates.

Physical Chemistry

Antioch Coll., Yellow Springs, Ohio.
RESEARCH ON AQUEOUS SOLUTIONS AT OR ABOVE THE CRITICAL TEMPERATURE OF WATER, by James F. Corwin. Final rept. for 1 Feb 57-30 Nov 58 on Physical Chemistry of Aqueous Solutions, Contract DA 36-039-sc-73211. [1958] 123p. 17 refs.
Order from LC mi$6.30, ph$19.80 PB 143 035

Phase I: The problem of corrosion and leakage gave this section of the project a considerable amount of trouble until September 1957. The double cylinder apparatus supported by the AFOSR gave excellent results when supported in one position only. Further development of the spark plug type autoclave by adding a platinum lining and coating the metal spark plug parts with a gold layer reduced corrosion to a minimum and the leakage problem was solved by A. C. Spark Plug Company. With this new system successful and consistent measurements have been made which check within the same order of magnitude with measurements made with different apparatus reported in the literature. Phase II: A whole series of experiments involving the reactions of alkaline earth metal oxides, hydroxides, phosphates, and fluorides with silica have been completed and a series of five summary type publications has been produced. One of these is concerned with pH concentrations. Phase III: (A) The relationship of pH to the type of crystalline silica formed was completed. (B) The mechanism of the reactions of fluoride ions with silica was extended to include reactions with alumina. (C) The effect of pH on the crystallization of alumina has also been investigated as a part of this problem of the relationship of the solution to the type of crystal formed. Phase IV: The work on GeO_2 and its relationship to the reactions of SiO_2 in sub-critical solutions has been completed and the work along with the analysis problems involved has been summarized. Phase V: The work in crystalline structure of the germanates discussed in Phase IV has been completed. (See also PB 140 257)

Armour Research Foundation, Chicago, Ill.
PRESSURE EFFECTS IN LUMINESCENCE: PART II. ISOBARIC EXPERIMENTS ON NaI(Tl), by L. Reiffel. Technical note no. 2 on Contract AF 49(638)113. 2 Feb 59, 31p. 12 refs. AFOSR TN-59-6; AD-208 302.
Order from LC mi$3.00, ph$6.30 PB 139 215

The effect of steady-state hydrostatic pressure on the properties of luminescent systems, with particular reference to the phosphorescence of NaI(Tl), is examined.

Ballistic Research Labs., Aberdeen Proving Ground, Md.
MICROWAVE SPECTRA OF THE GASEOUS PRODUCTS OF THE THERMAL DECOMPOSITION OF CELLULOSE NITRATE, by W. M. Kendrick and R. C. Morrow. July 58, 19p. 7 refs. Rept. no. 1051.
Order from LC mi$2.40, ph$3.30 PB 138 805

A number of gaseous products previously identified in nitro-cellulose thermal decomposition have been examined by microwave spectroscopic techniques. In addition, presence of some unidentified gaseous products has been detected. Curves showing changes in concentration as a function of nitrocellulose heating time of both identified and unidentified substances are given.

Brigham Young U., Provo, Utah.
AN INVESTIGATION OF RHENIUM AND ITS COMPOUNDS AS CATALYSTS IN ORGANIC REACTIONS, by H. Smith Broadbent. Final rept. for 6 June 54-6 Sep 58 on Contract AF 18(600)1164. [1958] 48p. 22 refs. AFOSR TR-58-143; AD-204 733.
Order from LC mi$3.30, ph$7.80 PB 138 719

This report briefly summarizes our work on the catalytic properties of rhenium and some of its compounds in hydrogenation reactions along with a note on the effect of rhenium trichloride on the course of Grignard reactions.

Brussels U. (Belgium).
ETUDE THEORIQUE D'UN SYSTEME CONTENANT UN PRODUIT AMPHOTERIQUE EN PRESENCE DE GRADIENTS DE pH ET DE POTENTIAL ELECTRIQUE, by Walter G. Kauman. 1957, 63p. 10 refs. AFOSR TN-58-648; AD-162 180. (In French)
Order from LC mi$3.90, ph$10.80 PB 138 996

The ionic disposition in an ampholyte has been studied in a stationary state under electric potential and pH gradients. Numerous related studies were also made and mathematical approach was attempted in coordinating the various data which were developed. (Text in French)

California U., Berkeley.
MATRIX ISOLATION STUDIES. INFRARED SPECTRA OF INTERMEDIATE SPECIES IN THE PHOTOLYSIS OF HYDRAZOIC ACID, II, by Mathias Van Thiel and George C. Pimentel. Rept. on Contract AF 49(638)1. 25 Feb 59, 26p. 18 refs. AFOSR-TN-59-223; AD-211 805.
Order from LC mi$2.70, ph$4.80 PB 142 827

Further infrared studies of the photolysis of hydrazoic acid in solid nitrogen at 20°K confirm the spectroscopic detection of unusual molecular species, as postulated earlier. The two most prominent bands, at 1325 and 1290 $cm.^{-1}$, are shifted by a factor near $\sqrt{2}$ when DN_3 is photolyzed. The data indicate the presence of either imine radical, NH_2, or diimide, N_2H_2. (See also PB 135 152)

California U., Berkeley.
ON THE DEVELOPMENT OF GASEOUS DETONATION I. APPRAISAL OF THE PROBLEM, by A. K. Oppenheim and R. A. Stern. Technical note DR 1 on Contract AF 49(638)166. June 58, 85p. 129 refs. AFOSR TN-58-

383; AD-154 290.
Order from LC mi$4.80, ph$13.80 PB 142 949

Current views about the phenomena associated with transition from deflagration to detonation are described. The history of the problem is traced from the "discoverers" of the detonative mode of combustion. Salient problems for future study are outlined.

Field Emission Lab., Pennsylvania State U., University Park.
STUDY OF METAL SURFACES BY THE FIELD EMISSION MICROSCOPE, by Russell D. Young. Technical rept. no. 9 on Theoretical and Experimental Tonal-Energy Distribution of Field Emitted Electrons, Contract AF 18(600)672. Dec 58, 51p. 9 refs. AFOSR TN-58-1136; AD-208 085.
Order from LC mi$3.60, ph$9.30 PB 139 217

General Atomic, San Diego, Calif.
FORMATION OF FREE-RADICAL SOLIDS USING ATOMIC-BEAM TECHNIQUES (PART I) [AND] MEASUREMENT OF VAPOR PRESSURE OF HYDROGEN AT TEMPERATURES BETWEEN 3° AND 10°K, (PART II) by Wade L. Fite and George L. Guthrie. Rept. on Contract AF 49(638)301. July 59, 53p. 16 refs. GA-803; AFOSR TN-59-364; AD-213 674.
Order from LC mi$3.60, ph$9.30 PB 142 972

Grinnell Coll., Iowa.
THE DESIGN AND CONSTRUCTION OF A BUNSEN ICE CALORIMETER AND HEAT CAPACITIES OF THE SILICA ALUMINA CRACKING CATALYST. PART A: STANDARDIZATION AND DETERMINATION OF HEAT CAPACITIES. PART B: DESIGN AND CONSTRUCTION, by William C. Oelke. Technical rept. 12, 1951-1954, on Contract N8onr-671(00). [1957] 21p. AD-142 931.
Order from LC mi$2.70, ph$4.80 PB 138 746

Previous investigations of the nature of the silica-alumina cracking catalyst have indicated the possibility that discontinuities of the heat capacity curves as a function of temperature might occur in the region of activation. A Bunsen ice calorimeter of large capacity was designed for the purpose of testing the above hypothesis.

Illinois Inst. of Tech., Chicago.
PHOTOCHEMICAL SYNTHESIS OF ENERGY RICH-COMPOUNDS, by Sei Sujishi and Tetsuyuki Hirata. Final rept. for 1 Feb 57-31 Aug 58 on Contract AF 49(638)48. 24 Oct 58, 65p. 46 refs. AFOSR TR-59-7; AD-209 421.
Order from LC mi$3.90, ph$10.80 PB 139 231

The results obtained for the mercury photosensitized reactions of methylmercuric chloride are presented and discussed.

Institute of Optics, U. of Rochester, N. Y.
EXCITON STATES IN SOLID ARGON, by Robert S. Knox. Rept. on Contract AF 18(600)688. Apr 58, 301p. 75 refs. AFOSR TN-58-370; AD-154 276.
Order from LC mi$11.10, ph$47.10 PB 139 003

Contents:
Electronic states in the static models of a solid rare gas
Numerical results for solid argon; discussion
The free rare gas atom
Diagonalization of certain matrices
One-, two-, and three-center integrals involving atomic s- and p-functions

Johns Hopkins U., Baltimore, Md.
DEVELOPMENT OF AN AUTOMATIC METHOD FOR THE DETERMINATION OF HEAT CAPACITIES OF ORGANIC LIQUIDS AND THEIR RECORDING ON PUNCH CARDS, by Donald H. Andrews. Final rept. for 1 June 53-31 May 59 on Contract AF 18(600)765. June 59, 22p. AFOSR TR-59-71.
Order from LC mi$2.70, ph$4.80 PB 142 938

A project was undertaken with the objective of developing and constructing a new type of calorimeter which would embody automatic recording and computing and at the same time make possible measurements of the high accuracy needed for the theoretical calculation.

Johns Hopkins U., Baltimore, Md.
A PHYSICO-CHEMICAL STUDY OF THE SYSTEM DIPHENYLMETHANE-DIPHENYL ETHER, by Robert H. Dettre. Technical note #4 on Contract AF 18(600)765. 1959, 20p. 26 refs. AFOSR-TN-59-309; AD-213 241.
Order from LC mi$2.40, ph$3.30 PB 142 845

Freezing point, density, viscosity and refractive index values are reported for the system diphenylmethane-diphenyl ether over the entire range of composition. Activity coefficients, volume changes on mixing and excess free energies of mixing have been calculated. The volumes of mixing are compared with those calculated from the excess free energies of mixing. The experimental fluidities are compared with those obtained from various theoretical considerations. The results show that the system exhibits slight negative deviations from ideal behavior.

Minnesota U., Minneapolis.
Be-C EQUILIBRIA, by R. L. Dowdell. Progress rept. no. 9 on NEPA Proj. SC-2017. 15 Jan 49, declassified 12 Nov 53, 6p. NEPA 883-UM-9; AD-204 964.
Order from LC mi$1.80, ph$1.80 PB 138 943

See PB 135 676

Notre Dame U., Ind.
SINTERING OF METAL OXIDES, by G. Parravano. Final project rept. for 1 Jan 57-31 Aug 58 on Contract AF 49(638)103. [1958] 5p. AFOSR-TR-58-166; AD-207 974.
Order from LC mi$1.80, ph$1.80 PB 138 735

Research program on the kinetics of sintering of metal oxides, zinc oxide, vanadium pentoxide and Titanium dioxide.

Noyes Chemical Lab., U. of Illinois, Urbana.
ELECTRODEPOSITION OF RARE-EARTH METALS FROM AQUEOUS AND NON-AQUEOUS SOLUTIONS, by Therald Moeller, Paul A. Zimmerman and others. Rept. on Contract AF 18(600)1535. 31 July 59, 25p. 46 refs. AFOSR-[TN]-59-75.
Order from LC mi$2.70, ph$4.80 PB 142 837

Electrodeposition of the rare-earth metals is possible in aqueous systems only with cathodes of very high hydrogen overvoltage (e.g., amalgams). Non-aqueous protonic solvents that are basic and combine the properties of high dielectric constant, low viscosity, and high heat of vaporization offer better possibilities. Electrolysis never yields more than small quantities of the metals unless mercury is the cathode.

Ohio State U. Research Foundation, Columbus.
THE VAPOR PRESSURE OF TITANIUM TETRACHLORIDE, by H. C. Weed and G. E. MacWood. Technical rept. no. 6 on Contract Nonr-495(06). Dec 57, 45p. 16 refs.
Order from LC mi$3.30, ph$7.80 PB 142 906

This investigation was undertaken in order to check on previous vapor pressure results by means of absolute measurements down to about 10 mm Hg, to extend the range of measurement to lower pressures by a spectrophotometric method, and to obtain numerical values for the absorption coefficient as a function of wavelength in the visible and ultraviolet region. The vapor pressure of $TiCl_4$ has been measured with good precision. The ultraviolet absorption spectrum of $TiCl_4$ vapor has been investigated.

Pennsylvania State U. Coll. of Chemistry and Physics, University Park.
DISCHARGE-INDUCED REACTIONS OF BORON HALIDES WITH SOME NONMETALLIC OXIDES, by Richard M. Rosenberg and Thomas Wartik. Doctoral thesis. Rept. on Contract AF 49(638)86. [1957] 158p. 65 refs. AFOSR TN-58-979; AD-162 278.
Order from LC mi$7.50, ph$24.30 PB 139 223

Although nonmetallic oxides such as carbon monoxide, carbon dioxide, and sulfur dioxide have not been reported to react with boron halides, the present investigations show that such reactions can occur in ozonizer-type discharge tubes. During this study, a comparison of the tendencies for various gas systems to undergo reaction in the discharge was made, and a significant portion of the work was devoted to an investigation of the nature of the discharge products.

Politecnico di Milano (Italy).
RESEARCH ON ANODIC AND CATHODIC BEHAVIOR OF METALS, by Roberto Piontelli. Final rept. on Contract AF 61(514)733-C. May 58, 30p. 39 refs. AFOSR TR-58-97; AD-162 165.
Order from LC mi$2.70, ph$4.80 PB 138 877

Content:
Introduction
Experimental methods
Anode and cathode overvoltages of polycrystalline: Au, Ag, Cu, Sn, Pb, Tl, Zn, Cd, In, Ni, Mg, Ti, Fe.
Discussion on some general aspects of the metal electrode behavior
Anion influence
Passivation and passivity
Systematic work of the electrochemical behavior of metallic single crystals
Systematic work on the electrode behavior of metals in fused salts and especially of aluminum in cryolite-alumina baths
General conclusions
Bibliography

Rochester U., N. Y.
PHOTOCHEMICAL STUDIES. LIV. THE NITROUS OXIDE-ETHANE SYSTEM: LIQUID PRODUCTS AND COMPETITIVE RATES, by E. Murad and W. Albert Noyes, Jr. Rept. on Contract AF 18(600)1528. 19 June 59, 19p. 13 refs. AFOSR TN-59-641.
Order from LC mi$2.40, ph$3.30 PB 142 976

The reactions of oxygen atoms produced by the direct photochemical decomposition of nitrous oxide with ethane have been studied. The relative rates of reaction of these atoms with ethane and with ethylene have been determined, the latter being about 330 times the former. Many of the products not volatile at -77° have been determined although a complete material balance has not been achieved. Many steps in the complete mechanism are suggested strongly by the natures of the products and their dependence on conditions. The oxygen atoms react so much more rapidly with some of the products than they do with ethane that the over-all mechanism is very complex. (See also PB 135 594)

Rochester U., N. Y.
THE PHOTOCHEMICAL TYPE II PROCESS IN 2-HEXANONE-5, 5-d_2 AND 2-HEXANONE, by R. Srinivasan. Rept. on Contract AF 18(600)1528. 20 Apr 59, 21p. 16 refs. AFOSR TN-59-423; AD-214 773.
Order from LC mi$2.70, ph$4.80 PB 143 003

University of Southern California, Los Angeles.
LIGHT SCATTERING BY SOLUTIONS OF LAURYL SULFATES, by L. H. Princen and Karol J. Mysels. Technical rept. no. 11 on Study of the Properties of Micelles, Contract Nonr-274(00). Sep 58, 60p. 31 refs
Order from LC mi$3.60, ph$9.30 PB 142 910

Contents:
Light scattering by some laurylsulfate solutions
Some effects of lauryl alcohol on light scattering by sodium lauryl sulphate

Utah U., Salt Lake City.
A SENSITIVITY TEST FOR KINETIC DATA, by John R. Morrey and George Richard Hill. Technical rept. no. 2 on Contract AF 49(638)28. 1958, 12p. 1 ref. AFOSR TN-59-1; AD-208 181.
Order from LC mi$2.40, ph$3.00 PB 138 782

Coast and Geodetic Survey, Washington, D. C.
UTILIZATION OF NEW TYPES OF DISTANCE MEASURING EQUIPMENT IN INTERGRATED MILITARY SURVEYS, by Paul D. Thomas. July 58, 76p. 56 refs.
Order from LC mi$4.50, ph$12.30 PB 143 271

In September 1957, the Coast and Geodetic Survey accepted a study project from the Engineering Research and Development Laboratories, Topological Engineering Department, Fort Belvoir, Virginia ostensibly for research in the utilization of new types of distance-measuring equipment for geodetic surveying (trilateration). In February 1958, because of fund limitations, the objectives were modified to a consideration of specific problems involving integrated military survey systems. This report combines the effort expended on both and is the final report under the current contract. In addition to this report a manual is presently planned combining operational procedures for best results with the Geodimeter and the Tellurometer when the Coast and Geodetic Survey has completed its evaluation of the Tellurometer.

Earthquake Research Lab., Calif. Inst. of Tech., Pasadena.
SPECTRUM ANALYSIS OF STRONG MOTION EARTHQUAKES, by J. L. Alford, G. W. Housner, and R. R. Martel. Technical rept. no. 1 on Contract N6onr-244, T. O. 25. Aug 51, 118p. 13 refs. AD-208 558.
Order from LC mi$6.00, ph$18.30 PB 143 319

The problem of the dynamic response of a structure to an earthquake has been formulated in a manner which permits separation of the characteristics of particular structures from the characteristics of the earthquake. The expression involving the characteristics of the earthquake is defined as the spectrum of the earthquake and it is shown that the spectrum is simply a plot of the response of a simple oscillator versus the period of the oscillator. Eighty-eight such spectra were computed by means of an electric analog computer and are presented.

Climatology and Meteorology

Army Signal Research and Development Lab., Fort Monmouth, N. J.
THE EFFICIENCY OF NATURAL RAIN AND ITS DETERMINATION, by Helmut Weickmann. 1 July 58, 17p. 9 refs. USASRDL Technical rept. 1973.
Order from LC mi$2.40, ph$3.30 PB 139 269

A study of the efficiency of natural rain has never been made in spite of the fact that it is of crucial significance in the physical evaluation of artificial rain. The present status of understanding of the precipitation mechanism is discussed, with emphasis on the significance of the particle concentration. A method is proposed for the determination of the efficiency of the precipitation mechanism by means of continuous records of the size, distribution, and concentration of raindrops.

Army Signal Research and Development Lab., Fort Monmouth, N. J.
HUMIDITY ELEMENT FOR VORTEX PSYCHROMETER, by Quentin Frazier. 1 Oct 58, 47p. 11 refs. USASRDL Technical rept. 1987.
Order from LC mi$3.30, ph$7.80 PB 138 792

This report covers the development and evaluation of a carbon resistance type of element of special cylindrical configuration for use in an axial-flow vortex-type aircraft probe.

California U., Los Angeles.
ON THE TRUNCATION ERROR, STABILITY AND CONVERGENCE OF DIFFERENCE SOLUTIONS OF THE BAROTROPIC VORTICITY EQUATION, by W. Lawrence Gates. Scientific rept. no. 1 on Dynamical Weather Prediction Project, Contract AF 19(604)3886. 30 June 59, 31p. 11 refs. AFCRC TN-59-403; AD-216 318.
Order from LC mi$3.00, ph$6.30 PB 143 195

The truncation error, stability and convergence properties of various finite-difference formulations of the one-dimensional barotropic vorticity equation are considered, and analytic solutions of the difference equations for simple harmonic initial conditions are presented. Using conventional centered space differences, the schemes considered may be classified according to the method of time differencing as the forward difference case (unstable), the first-forward-then-centered difference case (conditionally stable), and the implicit difference case (unconditionally stable). The first-forward-then-centered difference scheme, corresponding to that commonly employed in meteorological numerical integration, gives rise to an oscillation phenomenon in both the amplitude and phase speed of the solution, which is most serious for a small space mesh, a large time mesh, and for the shorter wavelength disturbances. In each difference scheme considered, the truncation error leads to a cumulative phase departure of the difference solution relative to the true solution, an effect which is approximately proportional to the cube of the wavelength.

Eastern Air Lines, Atlanta, Ga.
FURTHER STUDIES IN THE DEVELOPMENT OF SHORT-RANGE WEATHER PREDICTION TECHNIQUES, by J. J. George. Final rept. on Contract AF 19(604)2073. June 59, 113p. 14 refs. AFCRC-TR-59-254; AD-219 497.
Order from LC mi$6.00, ph$18.30 PB 142 969

New methods were developed for prediction of 30-hour movement of hurricanes and the intensity of certain types. Two studies attacked certain weather features for two geographic areas by means of analogue techniques. The remainder of the research was concerned with prediction of general fog and low ceilings, heavy snow, types of precipitation, fog at two United Kingdom

bases and Selfridge Field, the preparation of area weather prognostic charts with emphasis on warm frontal weather and high level wind analysis. Most of the studies include objective techniques for their application and were developed by empirical processes. Routine use of many of the studies have proved their value.

Electrical Engineering Research Lab., U. of Texas, Austin.
A PRELIMINARY CLIMATOLOGY OF REFRACTIVE INDEX LAYER CHARACTERISTICS; I. SOUTHWEST OHIO; WASHINGTON COAST, by V. E. Moyer and J. R. Gerhardt. Rept. on Contract AF 19(604)2249. 1 Nov 58, 31p. 16 refs. Rept. no. 6-26; AFCRC-TN-58-387; AD-160 841.
Order from LC mi$3.00, ph$6.30 PB 138 774

This report presents the results of preliminary statistical evaluations of the heights, thicknesses, and intensities of significant atmospheric layers over two such geographical areas; viz., Southwestern Ohio and over the offshore waters of the State of Washington. These evaluations are given in terms of frequency distribution accompanied, where possible, by gross correlations with synoptic-scale meteorological, climatological, and geographical properties.

Florida State U., Tallahassee.
AN INVESTIGATION OF THE VARIABILITY OF SURFACE-AIR TEMPERATURE OVER THE NORTH ATLANTIC OCEAN, by Stanley L. Rosenthal and Thomas A. Gleeson. Final rept. on Contract CWB-9272. 5 Aug 58, 276p. 41 refs.
Order from LC mi$11.10, ph$42.60 PB 138 970

Surface-air temperature records at nine North Atlantic Ocean-Vessel Stations are investigated with respect to diurnal and interdiurnal variations.

Institute of Atmospheric Physics, U. of Arizona, Tucson.
THE ROLE OF PRECIPITABLE WATER VAPOR IN ARIZONA'S SUMMER RAINS, by Clayton H. Reitan. Technical rept. no. 2 on Meteorology and Climatology of Arid Regions, Contract NSF-G1101. 31 Jan 57, 26p. 11 refs. AD-121 992.
Order from LC mi$2.70, ph$4.80 PB 138 916

The relation between Arizona's summer rains and the amount of water vapor in the air over Arizona was examined. It was found that the occurrence of rain was primarily determined by the moisture content of the air over the state, defined in this study by the amount of precipitable water at Phoenix. The effects of vertical wind shear and stability on the occurrence of rain were examined, but could not be precisely determined and are probably small as compared with the effects of precipitable water. Precipitation efficiency was found to vary directly with variations in the amount of precipitable water, but could be explained by changes in the evaporation of raindrops between cloud bases and ground in environments of differing precipitable water contents.

Naval Ordnance Test Station, China Lake, Calif.
A METHOD OF COMPUTING WINDS ALOFT USING RAWINSONDE DATA, by D. L. Farnham and P. H. Miller. 12 Aug 58, 11p. 1 ref. NOTS 2122; NAVORD rept. 6422.
Order from LC mi$2.40, ph$3.30 PB 143 316

A simplified and readily applicable technique, developed at the U. S. Naval Ordnance Test Station, for rapidly obtaining more accurate winds-aloft data based on rawinsonde information is presented.

Naval Ordnance Test Station, China Lake, Calif.
THE WEATHER AT NOTS 1946-1958, by Donald L. Farnham, Paul H. Miller, and Isabelle C. Vercy. Mar 59, 52p. 25 refs. NOTS TP-2218; NAVORD rept. 6527.
Order from LC mi$3.60, ph$9.30 PB 142 896

Surface and upper-air climatological conditions at the U. S. Naval Ordnance Test Station, China Lake, California, from 1946 through 1958, are summarized.

Purdue U. School of Aeronautical Engineering, Lafayette, Ind.
STUDY OF CALIBRATION DEVICES FOR WIND MEASURING EQUIPMENT: DESIGN PROPOSAL, by William W. Hill. Project rept. no. 3, 1 Jan-30 June 58, on Contract DA 36-039-sc-73257. [1958] 99p. 25 refs. Rept. no. A-58-6.
Order from LC mi$5.40, ph$15.30 PB 142 995

This report presents the design of the calibration equipment and represents the completion of the research program. The analysis of the various calibration methods as revealed by the literature survey and presented in Project Report No. 2, indicated the superiority of a wind tunnel type device for the calibration of wind measuring instruments in the speed range of from 0.2 to 25 mph.

Quartermaster Research and Engineering Center, Natick, Mass.
CLIMATIC ANALOGS OF FORT GREELY, ALASKA, AND FORT CHURCHILL, CANADA, IN NORTH AMERICA, by Andrew D. Hastings, Jr. Rept. on Military Evaluation of Geographic Areas. May 59, 72p. 103 refs. Environmental Protection Research Div. Technical rept. EP-111.
Order from LC mi$4.50, ph$12.30 PB 143 230

This study undertakes to indicate the extent to which the climatic environment at each of the test sites is representative of arctic and subarctic areas elsewhere in North America. Twelve climatic elements are mapped and analogous areas are indicated. Composite areas of analogy for multiple elements are also mapped. Areas of composite analogy with Fort Greely for winter and summer temperature and mean annual precipitation occur in the Tanana Valley of Alaska, southern Yukon Territory, and in small scattered areas of western Alaska. Fort Churchill analogy for the same combination of elements occurs in a 500-mile-wide salient stretching westward from Hudson Bay and a smaller patch in interior northern Quebec.

Texas A. and M. Research Foundation, College Station.
STUDY OF VARIATIONS OF BALLOON TRAJECTORY PATTERNS, by Guy A. Franceschini. Final rept. on Contract AF 19(604)2222. Oct 58, 30p. Reference 58-23F; AFCRC TR-58-286.
Order from LC mi$2.70, ph$4.80 PB 139 306

Work consisted of studies and experimental investigations directed toward the determination of: (a) methods and techniques for predicting balloon trajectories applicable to operational use, and from normally available analyses, data and prognoses; (b) the dynamics of air trajectories; (c) methods of utilizing balloon flight data in the preparation of forecasts of important weather elements.

Frost Science

American Geographical Society, New York.
GEOGRAPHIC STUDY OF MOUNTAIN GLACIATION IN THE NORTHERN HEMISPHERE. PART I: GENERAL ASPECTS, by William O. Field. Rept. on Contract DA 19-129-qm-409. Feb 58, 74p. 164 refs.
Order from LC mi$4.50, ph$12.30 PB 143 074

The report first includes a general review of the distribution and characteristics of glaciers, schemes of classification, and terminology. Followed by a discussion of the glaciers of the Northern Hemisphere region by region, outlining what is known of their behavior and their significance in terms of human activities. Later chapters deal with certain other aspects, including environment, glacier travel, and cartographic representation of glaciers. Most of the report is essentially a compilation of published information gathered and summarized from a great number of scattered sources in various languages. Much of it has required considerable interpretation.

American Geographical Society, New York.
GEOGRAPHIC STUDY OF MOUNTAIN GLACIATION IN THE NORTHERN HEMISPHERE. PART 2a: ALASKA AND ADJOINING PARTS OF CANADA, BOOK I, by William O. Field. Rept. on Contract DA 19-129-qm-409. Aug 58, 186p. 221 refs.
Order from LC mi$8.40, ph$28.80 PB 143 077

The present text is an effort to provide the first step toward a systematic approach by summarizing the information available up through the year 1956. It constitutes a review of the status of our knowledge of the distribution, characteristics, and behavior of the glaciers of this region prior to the initiation in July, 1957, of the International Geophysical Year program of observations.

[American Geographical Society, New York.]
GEOGRAPHIC STUDY OF MOUNTAIN GLACIATION IN THE NORTHERN HEMISPHERE. PART 2a: ALASKA AND ADJOINING PARTS OF CANADA, BOOK II. Rept. on Contract DA 19-129-qm-409. [Aug 58] 137p. 148 refs.
Order from LC mi$6.90, ph$21.30 PB 143 076

Those covered are: Coast Mts., St. Elias Mts., Chugach Mts., Kenai Mts., Talkeetna Mts., Wrangell Mts., Alaska Range, Aleutian Range, Aleutian Islands, Brooks Range, and Kilbrick and other mountains. (See also PB 143 077)

American Geographical Society, New York.
GEOGRAPHIC STUDY OF MOUNTAIN GLACIATION IN THE NORTHERN HEMISPHERE. PART 2b: WESTERN CANADA AND ARCTIC CANADA. Rept. on Contract DA 19-129-qm-409. Feb 58, 117p. 177 refs.
Order from LC mi$6.00, ph$18.30 PB 143 075

The following are discussed: Coast Mts of the Pacific ranges, and cascades of British Columbia, Interior ranges of British Columbia, Canadian Rockies, Northern Labrador, Baffin and Bylot Islands, Yukon and Northwest Territories, and Queen Elizabeth Islands. (See also PB 143 076)

American Geographical Society, New York.
GEOGRAPHIC STUDY OF MOUNTAIN GLACIATION IN THE NORTHERN HEMISPHERE. PART 3: UNITED STATES, MEXICO, AND NORTHERN ANDES. Rept. on Contract DA 19-129-qm-409. Feb 58, 69p. 153 refs.
Order from LC mi$3.90, ph$10.80 PB 143 079

Those covered are: Cascade and Olympic Mts., Sierra Nevada, American Rocky Mts., other glaciers of the U.S., Mexico, and the Northern Andes. (See also PB 143 075)

American Geographical Society, New York.
GEOGRAPHIC STUDY OF MOUNTAIN GLACIATION IN THE NORTHERN HEMISPHERE. PART 5. EUROPE AND AFRICA. Rept. on Contract DA 19-129-qm-409. Feb 58, 78p. 145 refs.
Order from LC mi$4.50, ph$12.30 PB 143 083

The glaciers of Europe and Asia are discussed: Scandinavia, the Alps, the Pyrenees, and Central Africa. (See also PB 143 078)

American Geographical Society, New York.
GEOGRAPHIC STUDY OF MOUNTAIN GALCIATION IN THE NORTHERN HEMISPHERE, PART 6. WESTERN, ARCTIC, AND EASTERN ASIA. Rept. on Contract DA 19-129-qm-409. Feb 58, 64p. 149 refs.
Order from LC mi$3.90, ph$10.80 PB 143 096

The glaciers of Turkey, Iran, Soviet Armenia, the Caucasus, the Ural Mountains, Northeast Asia and the Arctic Islands of the Soviet Union are discussed. (See also PB 143 083)

American Geographical Society, New York.
GEOGRAPHIC STUDY OF MOUNTAIN GLACIATION IN THE NORTHERN HEMISPHERE. PARTS 7a AND

7b, CENTRAL ASIAN MOUNTAIN SYSTEM (I) AND (II). Rept. on Contract DA 19-129-qm-409. Feb 58, 147p. 271 refs.
Order from LC mi$7.20, ph$22.80 PB 143 082

Part 7a concerns the glaciers of the Hindu Kush, the Karakoram, the Himalaya, the Pamir, and the Alay Mountains; Part 7b The Tien Shan, the Altay-Sayan Mts., the Kun Lun-Nan Shan Mts, and the Tibetan Highlands. (See also PB 143 096)

American Geographical Society, New York.
GEOGRAPHIC STUDY OF MOUNTAIN GLACIATION IN THE NORTHERN HEMISPHERE. PART 9. GLACIER AND HUMAN ACTIVITIES, by Charles C. Morrison. Rept. on Contract DA 19-129-qm-409. Feb 58, 80p. 64 refs.
Order from LC mi$4.50, ph$12.30 PB 143 080

The reports is divided into three chapters: (1) Glaciers and human activities, (2) Some aspects of glacier travel, and (3) Avalanches. (See also PB 143 081)

American Geographical Society, New York.
GEOGRAPHIC STUDY OF MOUNTAIN GLACIATION IN THE NORTHERN HEMISPHERE. PART 8. ENVIRONMENT AND CARTOGRAPHY. Rept. on Contract DA 19-129-qm-409. Feb 58, 30p. 31 refs.
Order from LC mi$2.70, ph$4.80 PB 143 081

The report is divided into two chapters. The 1st deals with vegetation and glacial geology, the 2nd with cartography in the service of glaciology. (See also PB 143 082)

Army Signal Research and Development Lab., Fort Monmouth, N. J.
THE SIGNAL CORPS FREEZING NUCLEI METER, by R. W. Fenn, H. K. Weickmann and others. 30 June 1958, 19p. 9 refs. USASRDL Technical rept. 1972.
Order from LC mi$2.40, ph$3.30 PB 139 074

An instrument for counting freezing nuclei is described. The theory and experimental verification of the thermal precipitation collection technique for deposition of nuclei are presented. Some results are given of measurements made at USASRDL, Fort Monmouth, New Jersey, and at Pasadena, California, during the Spring of 1957, and near Thule, Greenland, in July 1957. It was found that the response of freezing nuclei is a function of time. The activation time can be as long as five to ten minutes. Measurements in Greenland indicate that there are very few particles other than dust particles that act as freezing nuclei.

Army Snow Ice and Permafrost Research Establishment, Wilmette, Ill.
OCCURRENCE OF BLOWING SNOW ON THE GREENLAND ICE CAP, by M. Diamond and R. W. Gerdel. Rept. on Snow Blowing and Drift Formation. Apr 57, 8p. 2 refs. Research rept. 25.
Order from LC mi$1.80, ph$1.80 PB 143 317

Blowing snow is a major weather phenomenon on the northwest Greenland Ice Cap. It occurs most often in winter and is at a minimum during the months of June, July, and August. Blowing snow is most commonly associated with winds of more than 20 knots; however, blowing snow occurs about 30% of the time when wind velocities are between 15-19 knots. Very little blowing snow occurs at wind velocities of less than 15 knots. During periods of blowing snow, visibility is usually greater than one mile when wind speeds are less than 20 knots and decreases to less than one mile when wind velocities exceed 20 knots. Blowing snow occurs most frequently during periods when air temperatures are between 10 F to 14 F and -11 F to -25 F at Site 1 and between -1 F to -20 F and -41 F to -45 F at Site 2. Periods of continuous blowing snow are usually less than 24 hr in duration and almost half of all such periods are less than 6 hr in duration.

Deutscher Wetterdienst, Hohenpeissenberg (Germany).
OBSERVATIONS AND ANALYSIS OF SNOW CRYSTALS FOR PROVING THE SUITABILITY AS AEROLOGICAL SONDE, by Johannes Grunow and Dieter Huefner. Final rept. for 15 Jan 58-15 Jan 59 on Contract DA 91-508-EUC-286. 15 Feb 59, 151p. 23 refs. AD-217 431.
Order from LC mi$7.50, ph$24.30 PB 143 108

The purpose of the contract is to conduct consecutive observations and analysis of snow crystals for proving the suitability as aerological sonde, prepare a permanent record by making replicas of various snow crystals and by stereomicroscopic and microphotographic observation, and a general study of the formation of precipitation by use of contact photographs. In 36 operations, carried out from January to April 1958, snow samples were consecutively gathered during each snow-fall. The snow crystals were fixated photographically and as replicas. Photographic methods comprehended photos of natural crystals during the snow-fall by shadow-, macro-, and micro-technique. The crystals fixated as replicas were identified later by help of the stereo-micro-technique.

New Mexico Inst. of Mining and Tech., Socorro.
A STUDY OF THE ELECTRICAL PROPERTIES OF ICE, by F. K. Truby and E. J. Workman. Rept. no. 2 for the quarter ending 31 Oct 52 on Contract Nonr-815(01). [1952] 37p. AD-54 911.
Order from LC mi$3.00, ph$6.30 PB 143 311

An investigation of the electrical and certain physical properties of ice has been undertaken in order to obtain a clear understanding of conduction, rectification, and other related phenomena occurring in ice contaminated with minute amounts of impurities.

Geography

Texas U., Austin.
COASTAL STUDY OF SOUTHWEST MEXICO, by Donald D. Brand. Final rept. pt. 2 on Contract Nonr-

375(06). 15 Apr 58, 520p. 5 refs.
Order from LC mi$11.10, ph$78.90 PB 143 132

The body of this report consists of the detailed description of the strand and coast of Michoacán together with the 160-odd plates of photographic illustrations and the pertinent maps. (See also PB 136 467)

Wisconsin U., Madison.
ON THE PLACE, NATURE AND METHODS OF DESCRIPTION IN THE GEOGRAPHY OF LAND FORM, by Edwin H. Hammond. Technical rept. no. 1 on Procedures in the Descriptive Analysis of Terrain, Contract Nonr-1202(01). 26 July 57, 27p. 4 refs. AD-140 865.
Order from LC mi$2.70, ph$4.80 PB 138 914

Geology

California U., Berkeley.
THE LANDFORMS OF THE COCKPIT COUNTRY AND ITS BORDERLANDS, JAMAICA, by Alvin W. Urquhart. Rept. on Contract Nonr-222(11). 1958, 102p. 26 refs. AD-153 807.
Order from LC mi$5.70, ph$16.80 PB 142 918

Four-fifths of Jamaica is of calcareous origin, which in contrast with the noncalcareous fifth, is sparsely populated, agriculturally little productive, and topographically rugged. The roughest and least inhabited part of the limestone land is Cockpit Country where the processes that model landscape act under favorable conditions for the development of irregular topography. Row upon row of blind valleys and deep sinkholes separated by steep-sided ridges and cross ridges, all of which are covered by a dense and impenetrable tropical forest, characterize the area. This intensley pitted land stands in sharp contrast with the surrounding flat-bottomed valleys and stream-dissected hill lands. Geologically, the Country is composed of very soluble limestones which are bounded by exposures of impermeable sedimentary and volcanic materials on the southeast and west, by impure limestones and alluvium on the south and by a chalky limestone and alluvium on the north. Topographically, the Country is an undulating upland surface into which discontinuous, elongated blind valleys (glades) and deep circular solution depressions (cockpits) are eroded. Less intense local relief combined with surface streams is found in a nearly continuous band surrounding the Cockpit Country. Hydrologically, the Country is almost devoid of surficial drainage. All streams flowing into it disappear and continue their course underground or join the general water table. Culturally, the Country is almost empty.

Iowa Engineering Experiment Station, Ames.
GEOLOGY AND MECHANICAL STABILIZATION OF CENOZOIC SEDIMENTS NEAR POINT BARROW, ALASKA, by P. R. Carlson, K. M. Hussey and others. Final rept. 2 on Contract Nonr-530(04). 1 Mar 58, 101p. 47 refs.
Order from LC mi$5.70, ph$16.80 PB 139 193

The information which was obtained from these materials through various tests permitted the drawing of such conclusions as are contained in this report. Mineralogical analyses, particle shape and size distributions, moisture-density and consistency relationships, and bearing strength values were the main properties that were determined for each of the selected smaples. The maps accompanying this report, which show the geographic distribution of the more important samples and the geomorphic features of the Barrow area, are based on aerial photographs of the region.

Yale U., New Haven.
POSTGLACIAL CHANGES OF SEALEVEL IN SOUTHWESTERN MAINE, by Richard Foster Flint and Arthur L. Bloom. Annual summary rept. on Contract Nonr-609(25). 1 Dec 57, 4p.
Order from LC mi$1.80, ph$1.80 PB 138 646

Summary report based on three months general field study.

Mineralogy

Utah U., Salt Lake City.
COMPOSITION AND SIGNIFICANCE OF FLUID FILLED INCLUSIONS IN QUARTZ AND OTHER MINERALS, by Edwin Roedder. Quarterly progress rept. no. 1, 15 Feb-15 May 53, on Contract DA 36-039-sc-42635. [1953] 7p.
Order from LC mi$1.80, ph$1.80 PB 138 698

Practically every synthetic or natural quartz crystal other than the best optical grade has some fluid filled inclusions. A technique has been developed for the extraction and limited wet chemical and spectrographic analysis of the salts in solution in the fluids of these inclusions.

Utah U., Salt Lake City.
COMPOSITION AND SIGNIFICANCE OF FLUID FILLED INCLUSIONS IN QUARTZ AND OTHER MINERALS, by Edwin Roedder. Quarterly progress rept. no. 2, 16 May-15 Aug 53, on Contract DA 36-039-sc-42635. [1953] 14p.
Order from LC mi$2.40, ph$3.30 PB 138 697

Tests have been run on electrolytic cleaning of the quartz prior to fine grinding, and on electrodialysis techniques for the separation of the soluble ions out of the mixture of finely-ground quartz and water. (See also PB 138 698)

Utah U., Salt Lake City.
COMPOSITION AND SIGNIFICANCE OF FLUID FILLED INCLUSIONS IN QUARTZ AND OTHER MINERALS, by Edwin Roedder. Quarterly progress rept. no. 3, 15 Nov 53, on Contract DA 36-039-sc-42635. [1953] 11p.
Order from LC mi$2.40, ph$3.30 PB 138 696

Data have been obtained on the composition of the salts in solution in 5 samples of quartz from a variety of geologic occurrences. The composition of these fluids varies over a considerable range. (See also PB 138 697)

Utah U., Salt Lake City.
COMPOSITION AND SIGNIFICANCE OF FLUID FILLED INCLUSIONS IN QUARTZ AND OTHER MINERALS, by Edwin Roedder. Final rept. for 16 Feb 53-15 Feb 54 on Contract DA 36-039-sc-42635. [1954] 32p. 2 refs.
Order from LC mi$3.00, ph$6.30 PB 138 695

The majority of fluid filled inclusions in natural quartz samples contain a water solution rich in chlorides and carbonates of K and Na, with lesser amounts of other ions. The ratios between various cations and between various anions are relatively reproducible and vary significantly from one type of occurrence to another. (See also PB 138 696)

Oceanography

Narragansett Marine Lab., U. of Rhode Island, Kingston.
ACOUSTIC FOULING PROJECT, by Harold Berkowitz, William B. Birch and others. Final rept. on Contract Nonr-396(06). July 57, 11p. 5 refs. Ref. no. 57-7.
Order from LC mi$2.40, ph$3.30 PB 138 919

The effect of the NMC echo sounding equipment on macro fouling organisms in Narragansett Bay was investigated. The data indicated that the NMC echo sounder has some effect on the growth of Mytilus edulis but no influence on the over-all fouling population. A more extensive interpretation of its influence on M. edulis or any interpretation at all of its effect on algae, hydroids, barnacles, or other fouling organisms appeared unwarranted.

New York U. Coll. of Engineering, N. Y.
CONTRIBUTIONS TO THE STUDY OF THE OCEANIC CIRCULATION, by Gerhard Neumann, Feodor Ostapoff and El Sayed Mohammed Hassan. Rept. on Contract Nonr-285(12). Sep 57, 116p. 31 refs.
Order from LC mi$6.00, ph$18.30 PB 138 961

Contents:
On the depth of the layer of no motion in the Central Pacific Ocean, by Feodor Ostapoff
Mean water transport by wind driven ocean currents in the North Atlantic for the month of February, by Gerhard Neumann and Feodor Ostapoff
On the ocean circulation, by El Sayed Mohammed Hassan

Woods Hole Oceanographic Institution, Mass.
EVALUATION OF THE SPERRY SOUND WAVE RAY TRACER, by A. L. Bradshaw and J. B. Hersey. Final rept. on Contract Nonr-1790(00). Mar 58, 40p. 4 refs. Reference no. 58-13.
Order from LC mi$3.00, ph$6.30 PB 139 330

The Sperry Sound Wave Ray Tracer has been at WHOI since June 1955 for evaluation. During this time it has performed valuable work although certain types of errors which occur have limited its usefulness. The following report presents a final evaluation of the computer which covers the entire period the instrument has been at WHOI. It also gathers together previous evaluation reports and memoranda and includes a report for the period January 1957 to February 1958. The final evaluation includes much information which duplicates that found in the earlier evaluation reports, but it elaborates more on certain results mentioned in these and, it is hoped, is developed in a more logical order.

Physics of the Atmosphere

California U., Los Angeles.
THE FLUX OF RADIATION FROM THE TOP OF A RAYLEIGH ATMOSPHERE, by Kinsell L. Coulson. Scientific rept. no. 1 on Light in the Atmosphere, Contract AF 19(604)2429. Jan 59, 196p. 81 refs. AFCRC TN-59-402; AD-216 317.
Order from LC mi$8.70, ph$30.30 PB 142 870

The theory of radiative transfer, as developed by Chandrasekhar, was used for determining the flux outward from the top of a plane parallel molecular atmosphere. High speed electronic computers were used for the extensive computations necessary to determine the total intensity, the degree of polarization, and the plane of polarization of the emergent radiation. The numerical results are too extensive for inclusion in toto, but are available in both tabular and punched-card form. Typical examples of the data are presented in the considerable number of accompanying figures. The intensity of the radiation scattered by the molecules of the air and emerging from the top of the atmosphere is generally of the same order of magnitude as that of skylight. The contribution of molecular scattering to the albedo of the planet earth is evaluated. The validity of the restrictive assumptions is evaluated on the basis of the known characteristics of large particle scattering, sphericity of the actual atmosphere, and surface reflectivity.

Ionosphere Research Lab., Pennsylvania State U., University Park.
IONOSPHERIC EFFECTS OF SOLAR FLARES. 1. EVALUATION OF EXPERIMENTAL DATA, by A. P. Mitra. Scientific rept. no. 112 on Ionospheric Research, Contract AF 19(604)3875. 15 Oct 58, 61p. 26 refs. AFCRC TN-59-203; AD-210 316.
Order from LC mi$3.90, ph$10.80 PB 138 811

This is the first of a series of reports dealing with the ionospheric effects of solar flares. The present work describes the various radio and magnetic data and deals with initial methods of analysis. These include long and short radio wave absorption, change in phase, height and, to a lesser extent, group height measurements. Magnetic crochets are also treated from the

viewpoint of the current systems by which they are produced.

Ionospheric Research Lab., Pennsylvania State U., University Park.
IONOSPHERIC ELECTRON DENSITIES FOR WASHINGTON, D. C., PANAMA, TALARA AND HUANCAYO. NUMBER 3, SEPTEMBER 1957, by E. R. Schmerling. Scientific rept. no. 111 on Ionospheric Research, Contract AF 19(604)3875. 10 Sep 57, 99p. 3 refs. AFCRC TN-58-619.
Order from LC mi$5.40, ph$15.30 PB 139 277

McGill U. (Canada).
THE STUDY OF THE KINETICS OF NEUTRAL AND IONIZED ATMOSPHERIC GASES, by H. I. Schiff. Final rept. no. 1 on Contract AF 19(604)1488. Sep 58, 124p. 6 refs. AFCRC TR-59-248; AD-216 320.
Order from LC mi$6.30, ph$19.80 PB 142 970

Four studies are covered: A mass spectrometric study of normal oxygen and oxygen subjected to electrical discharge; The study of electrically discharged O_2 by means of an isothermal calorimetric detector; The reaction of oxygen atoms with NO; A modification of the R. P. D. method for measuring appearance potentials.

Maryland U., College Park.
PROPERTIES OF THE UPPER ATMOSPHERE DEDUCED FROM THE RADIATION BELT, by S. F. Singer. Rept. on Contracts AF 49(638)530 and AF 19(604)5575. [1959] 23p. 17 refs. AFCRC-TN-59-386; AFOSR-TN-59-158; AD-211 117.
Order from LC mi$2.70, ph$4.80 PB 143 182

A new theory has been developed which gives the distribution of density with altitute for a planetary exosphere in the absence of thermodynamic equilibrium. The results differ considerably from those calculated on the basis of a hydrostatic equation.

New York U. Coll. of Engineering, N. Y.
CLEAR AIR TURBULENCE, by Joseph Clodman and John T. Ball. Final rept. on Contract AF 19(604)3068. June 59, 52p. 51 refs. AFCRC-TR-59-260.
Order from LC mi$3.60, ph$9.30 PB 143 188

The literature of clear air turbulence is reviewed critically. The anisotropy of high level turbulence is investigated qualitatively by means of simultaneous subjective reports and airspeed cell measurements. It is concluded that anisotropy sometimes occurs, especially in the stratosphere, and that aircraft bumpiness may be caused by horizontal gusts. An investigation of the association between moderate topography and high level turbulence shows nearly conclusively that there is an association and that it is related to the wind at 850 mb.

Bureau of Yards and Docks, Washington, D. C.
PONTOON GEAR HANDBOOK. 7 July 53, 411p. Technical pub. NAVDOCKS TP-PL-7 incl. change 1; BUDOCKSINST 11470.
Order from LC mi$11.10, ph$63.60 PB 142 888

This handbook covers all phases of standard pontoon structures and operations, from assembly and launching of single strings of the basic hollow steel box units to the construction and operation of the largest standard assemblies utilized for barges, bridges, wharves, floating drydocks, and floating cranes.

Aeronautical Engineering

Allied Research Associates, Inc. [Boston, Mass.]
THERMOELASTIC STUDIES ON HEATED AIRCRAFT SECTIONS WITH CORRELATION OF EXPERIMENTAL DATA, by Edward I. Gray, Irving Frank, and Leon J. Atamian. Rept. on Contract AF 33(616)5001. Sep 57, 112p. 14 refs. WADC Technical rept. 57-184; AD-131 014.
Order from LC mi$6.00, ph$18.30 PB 138 992

The experimental program consisted of exposing a number of instrumented B-47 elevator sections to the radiant thermal source and the subsequent recording of strain, temperature and deflection. Twelve specimens were tested with variations in heat rate and maximum temperature rise. Strain relief is afforded in the substructure as it heats up and, that for the type of input imposed on the structure, the ribs show no trend toward becoming critical. The experimental strain levels measured on the skin adjacent to the rib flanges are influenced by local instabilities induced by random buckles in the vicinity of the edge restraints. Theoretical methods are used to define the point of skin failure.

Army Transportation Research and Engineering Command, Fort Eustis, Va.
250-HORSEPOWER TURBINE ENGINE (PARAMETRIC DESIGN STUDIES), by Ralph R. Herrick, Stanley H. Spooner, and Frederick P. Boeuche. Rept. on Contracts DA 44-177-tc-(374-377). June 58, 42p. Interim rept. no. 1 on Proj. 9-49-13-000, Task 406AV; AD-148 482.
Order from LC mi$3.30, ph$7.80 PB 138 929

This report evaluates four contractual studies which were conducted to determine the technical feasibility of developing a free-shaft gas turbine engine of 250 horsepower. Basic characteristics of a small gas turbine engine are discussed. The report includes development specifications for a 250-horsepower gas turbine engine.

Battelle Memorial Inst., Columbus, Ohio.
SHORT-TIME CREEP PROPERTIES OF STRUCTURAL SHEET MATERIALS FOR AIRCRAFT AND MISSILES, by John A. Van Echo, Damian V. Gullotti and others. Rept. for Apr 54-June 55 on Materials Analysis and Evaluation Techniques, Contract AF 33(038)8743. Jan 56, 79p. 22 refs. AF Technical rept. 6731, Pt. 4; AD-91 776.
Order from LC mi$4.50, ph$12.30 PB 129 516

Creep properties are reported for several commercial sheet materials including RD-70 titanium, 61S-T6 and 75S-T6 aluminum alloys, SAE 4130 steel, the heat-resistant Alloy Steel A-286, and two stainless steels – 17-7 PH and Type 410. The test results were obtained under special short-time (1/2 to 120 minutes), rapid-heating (50 to 250 F per second) test conditions to simulate service conditions. Each alloy was tested over the useful temperature range for the particular material. Applications of these alloys under special short-time conditions might include skin material for supersonic vehicles, combustion chambers for rockets and missiles, and other structural parts in aircraft and missiles.

Bendix Products Div., Bendix Aviation Corp. [South Bend, Ind.]
STUDY AND PRELIMINARY DESIGN OF A HIGH TEMPERATURE AIRCRAFT WHEEL, BRAKE, AND TIRE ASSEMBLY, by Gilbert T. Stout. Rept. for 5 May 58-4 May 59 on An 800°F Wheel, Brake and Tire System, Contract AF 33(616)5503. May 59, 84p. 67 refs. WADC Technical rept. 59-210; AD-216 630.
Order from OTS $2.25 PB 161 041

Design of a wheel, brake, and tire capable of operating from an ambient temperature of 800°F appears feasible. However, there are many areas which necessitate intensified study. Most prominent are mechanical tire approaches, bearings and lubricants, and hydraulic or pneumatic dynamic seals. The mechanical tire, and tread material, is the most revolutionary and challenging region to be conquered. Various mechanical tire approaches were herein considered. Designs utilizing spring configurations were more acutely investigated. Initial studies indicate that a mechanical tire possessing a spring configuration will involve a considerable weight penalty in comparison to the conventional wheel and casing presently being used for low temperature applications.

Dynamic Analysis and Control Lab., Mass. Inst. of Tech., Cambridge.
DESIGN OF TURBINES FOR HIGH-ENERGY-FUEL LOW-POWER-OUTPUT APPLICATIONS, by Alan H. Stenning. Rept. on Contract NOrd-9661. 30 Sep 53, 30p. 4 refs. Rept. no. 79.
Order from LC mi$2.70, ph$4.80 PB 143 342

In many applications a turbine is driven by a high-energy, high-pressure working fluid, but the actual horsepower output required is low. This report discusses the choice of a turbine for such an application and suggests a method for determining the optimum blade speed for maximum efficiency. The results of tests carried out on small turbines with full and partial admission are presented. It has been found that small turbines with aspect ratios less than 0.4 can have full-admission efficiencies of 60 per cent or greater with a velocity ratio of 0.3 and efficiencies greater than 45 per cent at 6 per cent admission with velocity ratios in the range of 0.2 to 0.3.

Fairchild Aircraft Div., Hagerstown, Md.
JET WING PERFORMANCE AND STABILITY PROCEDURES: MODEL M-246. Rept. on Contract Nonr-2226(00). 24 Apr 58, 100p, 5 refs. Engineering rept. no. R246-004; AD-202 151.
Order from LC mi$5.40, ph$15.30 PB 142 558

This report presents the procedures for estimating the performance and stability of the jet flap type aircraft. In setting up the procedures it was necessary to develop, in conjunction with NACA test results, the basic aerodynamic coefficients to be used in these procedures. The equations for the basic aerodynamic coefficients, level flight analysis, climb and descent, take-off and landing, wave-off conditions, maneuvering flight, gust loads analysis and stability estimates, as well as a discussion of performance margins used in this investigation, are presented herein.

Institute for Fluid Dynamics and Applied Mathematics, U. of Maryland, College Park.
PHENOMENA SURROUNDING HIGH SPEED FLIGHT, by J. M. Burgers. Final rept. on Contract AF 18(600)993. Aug 58, 11p. 40 refs. AFOSR TR-58-115; AD-202 116.
Order from LC mi$2.40, ph$3.30 PB 143 232

[Martin] Co., Baltimore, Md.
DEVELOPMENT OF BRAZED SANDWICH CONSTRUCTION MATERIAL FOR HIGH-TEMPERATURE APPLICATION, by W. Maxwell, J. Siltanen, and J. Mueller. Rept. on Metallic Materials, Contract AF 33(616)2602. Mar 56, 78p. WADC Technical rept. 55-463; AD-94 176.
Order from LC mi$4.50, ph$12.30 PB 130 401

Procedures were developed for brazing honeycomb cores to stainless steel skins to form sandwich material suitable for elevated temperature applications. After a preliminary investigation, 17-7PH stainless steel skin and core material and Coast Metals No. 53 brazing alloy were selected for the process development work. Several brazing methods were studied and muffle brazing in an inert atmosphere was selected for the production of two-by-two foot panels. The protected-core-container method was also developed and its feasibility demonstrated on a two-by-two foot panel. The large panels produced will be supplied to the Materials Laboratory, Wright Air Development Center, for testing and evaluation. During the course of the investigation, flexure testing and metallographic examinations were used for general screening and evaluation of the methods, heat treatments, and brazing variables.

Martin Co., Baltimore, Md.
SPEED OF REACHING TO CRITICAL CONTROL AREAS IN A FIGHTER-TYPE COCKPIT, by M. R. Green and F. A. Muckler. Rept. on Human Engineering Support to the Air Force Flight Control and Flight

Display Integration Program, Contract AF 33(616)5472. June 59, 23p. 6 refs. WADC Technical rept. 58-687.
Order from OTS $0.75 PB 161 038

Speed of reaching to nine critical cockpit control areas in a fighter-type cockpit was studied. Controls on the right side of the cockpit were reached more rapidly than controls on the left side. The optimum area was on the right side console forward of the arm rest. Poorest areas were at the extreme right, extreme left, and lower middle of the center instrument panel. The performances of pilot and non-pilot subject groups did not differ.

Mississippi State Coll., State College.
A SIMPLIFIED PROCEDURE FOR CALCULATING BOUNDARY LAYER CONTROL SYSTEMS FOR UNFLAPPED AIRFOILS, by J. J. Cornish, III. Research rept. no. 15 on Contract Nonr-978(01). 28 Feb 58, 21p. 6 refs.
Order from LC mi$2.70, ph$4.80 PB 139 314

The feasibility of utilizing suction through distributed perforations as a means to delay turbulent separation of the flow over an airfoil and thus reduce the aircraft stall speed has been clearly demonstrated. This paper presents a simplified procedure, formulated from Prandtl's form of vonKarman's momentum equation, for calculating the suction distribution, pump pressure, quantity flow requirements, distribution of perforations and power requirements for such a boundary layer control system.

National Research Labs., Ottawa (Canada).
MEASUREMENT OF AERODYNAMIC DAMPING AND STIFFNESS DERIVATIVES IN FREE OSCILLATION WITH AUTOMATICALLY RECYCLED FEEDBACK EXCITATION, by K. J. Orlik-Rückemann. June 59, 13p. 2 refs. Aeronautical rept. LR-246.
Order from LC mi$2.40, ph$3.30 PB 142 882

A dynamic test technique for obtaining the aerodynamic damping and stiffness derivatives is described. The technique is based on the method of free oscillation and it employs automatically recycled feedback excitation. The technique has been found to be very convenient, fast and accurate and is of particular interest for tests in intermittent wind tunnels because of its very efficient use of the short running times available. The technique is presented here together with a description of an experimental apparatus for oscillation-in-pitch tests on half models, where it was first used. The same technique can be used, of course, for any single degree-of-freedom oscillation experiment.

National Research Labs., Ottawa (Canada).
POWERPLANTS FOR VTOL AIRCRAFT: PERFORMANCE CALCULATIONS FOR SEVERAL HYPOTHETICAL TURBOFAN ENGINES, by E. P. Cockshutt, N. Galitzine and T. Weibust. 17 July 59, 80p. 6 refs. Aeronautical rept. LR-256.
Order from LC mi$4.50, ph$12.30 PB 142 879

Calculated performance data are presented in tabular form for a wide range of altitudes, forward speeds, and engine speeds, for four hypothetical aft-turbofan engines, of bypass ratios 0, 1.39, 3.13, and 8.24. These performance data are used along with weight estimates to illustrate the application of turbofan engines to a typical VTOL mission. It is shown that on the basis of powerplant system weight (engine plus fuel), the highest bypass cycle is clearly superior. The high bypass cycles suffer from a tendency of the fan to overspeed at high forward speeds, so that the gas generator must be throttled back considerably. The high level of installed thrust means that the thrust reduction accompanying throttling is no problem, except insofar as it adversely affects the specific fuel consumption.

National Research Labs., Ottawa (Canada).
R. P. M. INDICATOR AND OVERSPEED TRIP, by R. J. Harron. 8 May 59, 10p. 1 ref. Mechanical engineering rept. MI-819.
Order from LC mi$1.80, ph$1.80 PB 142 877

The function of this dual-purpose instrument is (i) a coarse r. p. m. indicator and (ii) an adjustable overspeed trip relay having two overlapping ranges of 11,000 to 16,000 r. p. m. and 15,000 to 20,000 r. p. m. The instrument requires approximately 8 watts of power from a 110-volt a-c. line. Solid-state amplifiers and saturable core transformers provide virtually trouble-free operation. The input signal is derived from a magnetic proximity pick-up. The overspeed trip contact can be set to make within ±30 r. p. m. of a chosen speed. The accuracy of the r. p. m. indication on the expanded scale meter is better than 0.1 percent and is insensitive to changes of the amplitude of the input signal above a minimum of 0.25 volt.

National Research Labs., Ottawa (Canada).
A SMALL WIND TUNNEL FOR INVESTIGATING THE CHARACTERISTICS OF A WING IN A FINITE JET INCLUDING RESULTS OF A MODEL WITH A SUCTION FLAP, by D. J. Marsden. 28 May 59, 53p. 12 refs. Aeronautical rept. LR-255.
Order from LC mi$3.60, ph$9.30 PB 142 880

The small open return blower tunnel described here was built for investigating the factors affecting the ability of a wing-flap combination to deflect a slipstream. It produces an 8-inch diameter circular free jet with good flow uniformity at velocities up to 145 ft./sec. This jet can be considered a simplified model of a fully contracted slipstream without rotation in which wing-flap models can be mounted in order to measure the lift and drag forces and pitching moment developed, using a specially designed strain gauge balance.

National Research Labs., Ottawa (Canada).
SOME DATA ON ELEVATOR DAMPING AND STIFFNESS DERIVATIVES ON A DELTA WING AIRCRAFT MODEL AT SUPERSONIC SPEEDS, by K. J. Orlik-Rückemann. June 59, 13p. 4 refs. Aeronautical rept. LR-250.
Order from LC mi$2.40, ph$3.30 PB 142 881

Elevator hinge moment derivatives at supersonic speeds were determined on a half model of a delta wing aircraft, using an apparatus for free oscillation

tests on small surfaces. The results obtained have been compared with results of theoretical calculations.

Polytechnic Inst. of Brooklyn, N. Y.
THERMAL BUCKLING OF SOLID WINGS, by Josef Singer. Rept. on Contract Nonr-839(18). Oct 57, 63p. 12 refs. PIBAL rept. no. 408; AD-153 615.
Order from LC mi$3.90, ph$10.80 PB 138 855

The thermal buckling of wings with all edges free is analysed by the Rayleigh-Ritz Method. First, wings of large aspect ratio are treated and the end effects are neglected. A double power series is assumed for the deflection function, and through the use of successively increasing numbers of terms the predominance of the simple torsional distortion is established. The analysis is carried out for a number of typical temperature distributions for a plate of constant thickness and for a solid wing of parabolic cross section.

Poulter Labs., Stanford Research Inst., Menlo Park, Calif.
PENETRATION OF METAL AND LUCITE TARGETS BY SMALL PARTICLES, by Samuel Katz and Gordon D. Anderson. Scientific rept. no. 1 on Contract AF 19(604)1892. 25 Feb 57, declassified 12 Dec 58. 36p. 17 refs. AFCRC TN-57-452; AD-117 200.
Order from OTS $1.00 PB 151 988

Astronomic and meteoritic data indicate that particle radii from 1μ to 1 mm with velocities up to 72 km/sec may be encountered during a flight. This paper reports the first results of an experimental program to reproduce and study the impact of small particles in this size range with velocities attainable by available explosive techniques. For metal particles and lucite targets the maximum depth-diameter ratios are between 10 and 20. Some plastics may have a self-healing action, consisting of a decrease in hole diameter after passage of the particle.

Scott Aviation Corp., Lancaster, Pa.
DEVELOPMENT OF AN EMERGENCY PRESSURIZATION SYSTEM FOR AN ESCAPE CAPSULE, by A. E. Miller and E. H. Replogle. Rept. on Contract AF 33(616)5005. May 59, 46p. WADC Technical rept. 58-397; AD-216 307.
Order from OTS $1.25 PB 161 029

An Emergency Pressurization System for an Escape Capsule was developed. It included its own "bottled" high pressure air supply and a sequential system of controls whereby, after being armed either manually or by separation from the aircraft, the system automatically (as a result of the sensing of the drop of cockpit pressure) releases its air at the rate required for fast repressurization. It then cuts short the fast repressurization as soon as the capsule pressure has again returned to a safe level, and directs the air through as absolute pressure regulator which maintains this level, compensating for capsule leakage. It was found that the second aneroid triggering device could be set off prematurely by shock waves formed by the too sudden release of unrestricted pressure when attempts were made to repressurize in times considerably shorter than five seconds. The pressure waves were recorded and means devised to avoid them. The reasons for choice of the types of mechanical elements provided and the effects of acceleration and environment on their satisfactory operation are discussed. A brief review of the test results is included, and the report is concluded with recommendations to writers of future specifications for equipment of this nature.

Southern Research Inst. [Birmingham, Ala.]
TENSILE PROPERTIES OF AIRCRAFT-STRUCTURAL METALS AT VARIOUS RATES OF LOADING AFTER RAPID HEATING, by J. Robert Kattus. Rept. for Jan 53-June 58 on Material Analysis and Evaluation Techniques, Contract AF 33(616)3996. May 59, 187p. 25 refs. WADC Technical rept. 58-440, Pt. 2; AD-213 834.
Order from OTS $3.00 PB 151 895

A summary and an analysis are presented of the results of five years of investigation of the short-time tensile properties of structural metals. The specimens that were tested in this investigation were heated to test temperature within 10 sec, were held at test temperature for 10 sec to 30 minutes, and were then loaded to failure at strain rates from 0.00005 to 1.0 in./in./sec. (See also PB 151 566)

Surface Combustion Crop., Columbus, Ohio.
DEVELOPMENT STUDY OF A TITANIUM AIR-TO-AIR HEAT EXCHANGER, by Robert E. Lear. Rept. for Oct 53-Sep 54 on Contract AF 33(616)2245. May 58, 95p. 19 refs. WADC Technical rept. 54-453; AD-151 156.
Order from LC mi$5.40, ph$15.30 PB 143 501

An analysis was made, without experimentation to disclose characteristics of aircraft air-to-air heat exchanger designs which appeared optimum for fabrication from titanium metal. Both conventional types and relatively unexplored surface types were considered. The types found to be optimum, based on the criteria evolved, were identified as brazed tubular exchangers and plate-like or dimpled-plate exchangers. An extended surface design was found to exhibit excessive weight. The analysis further disclosed that it would be necessary to develop a brazing technique capable of executing the many inaccessible junctions common to heat exchanger cores. Of the brazing alloys reported, silver was selected as optimum for use in titanium heat exchanger junctions. Other brazing alloys exhibited low joint strength and failure by brittle shear fracture.

Technical Development Center [Federal Aviation Agency] Indianapolis, Ind.
FORE-DETECTION REQUIREMENTS FOR THE MARTIN XP6M-1 AIRPLANE POWERPLANT, by Joseph Osman. Dec 58 [10]p. 1 ref. Technical Development Rept. no. 320.
Order from OTS $0.50 PB 151 576

Studies of the flame paths occurring within the XP6M-1 powerplant from fuel fires were made and effective

locations for detector sensing elements were determined. The requirements for both continuous- and surveillance-type systems were established. The final proposed system configurations were tested under simulated full-scale conditions of flight and surface operation and found to provide effective coverage of the engine nacelle space and to detect the existence of fire rapidly.

Technical Development Center, [Federal Aviation Agency] Indianapolis, Ind.
SIMULATION OF PROPOSED ATC PROCEDURES FOR CIVIL JET AIRCRAFT, by Paul T. Astholz and Tirey K. Vickers. Preliminary rept. Dec 58, 25p. Technical Development rept. no. 352.
Order from OTS $0.75 PB 151 426

This report describes an extensive simulation program which was conducted by the CAA Technical Development Center to study operational requirements and control techniques for handling civil jet aircraft in present and future air traffic control systems. Starting with a brief review of current simulation methods, the report discusses the special problems associated with the control of civil jet aircraft. A significant development which emerged from the simulation tests was the paradox that, in high-density terminal operations, an over-all fuel saving would result if low-altitude holding procedures were used instead of the high-altitude procedures formerly considered essential. It was found that the reduction of delays, made possible by the higher efficiencies of approach systems utilizing low-altitude holding procedures, would more than compensate for the increased fuel-flow rates of jet aircraft at the lower altitudes. The simulation tests explored a number of concepts in the field of arrival scheduling control, including the use of velocity control, en route delay patterns, and various methods for sequencing arriving aircraft. It is expected that much of this work can be applied in the development of operational philosophy and equipment design for future air traffic control systems.

Vertol Aircraft Corp., Morton, Pa.
STOL/VTOL PROPELLER STUDY-STRESS AND WEIGHT ANALYSIS, by W. B. Peck and D. H. Mancill. Rept. on Contract AF 33(600)35021. Mar 58, 35p. 8 refs. Stress and Weight rept. VAC no. R-142; WADC Technical rept. 58-99; AD-151 057.
Order from LC mi$3.00, ph$6.30 PB 143 270

The basic design criteria and detail configuration of the propeller was specified by the United States Air Force R and D Exhibit. The design study led to the selection of fiberglas laminate as the primary structural material for the blade. In this report the detailed weight, section properties, applied stresses and margins of safety are calculated for the final design.

Chemical Engineering

Aerosol Lab., Stanford U., Calif.
FP-SO_2 COMPARATIVE DIFFUSION: PART II, by F. X. Webster and Philip A. Leighton. Stanford quarterly rept. 111-12, Jan-Mar 57, on Studies in Gas and Aerosol Cloud Behavior, Contract DA 42-007-403-cml-111. [1957] 132p. AD-145 646.
Order from LC mi$6.90, ph$21.30 PB 143 312

Each of 24 trials was compared on the basis of coincidently measured FP-SO_2 dosages obtained along sampling arcs at 48, 100, and 200 yd downwind from a common source point. FP aerosol is a finely powdered solid material of density 4 which can be aerosolized as 1- to 5-μ-diam particles. Meteorological conditions affecting the FP-SO_2 cloud behavior included winds ranging from 2.6 to 16.4 mph, and temperature gradients (1/2 to 4 meters) ranging from 2.6°F lapse to 2.6°F inversion. Evaluation of the FP-SO_2 source-adjusted dosages included consideration of the 2 materials on the basis of intercomparable crosswind integrated dosages (CWID) and of dosage ratios obtained at individual sampling stations. The configurations of corresponding FP and SO_2 crosswind dosage profiles were similar. The FP/SO_2 CWID ratio did not significantly change with increasing downwind distance. The FP/SO_2 dosage ratios at individual stations showed no statistically significant tendency to change progressively with downwind distance. Under similar conditions, the FP CWID slope was not statistically different from the SO_2 CWID slope. Both the FP and SO_2 CWID slopes responded in a similar and normally expected manner. For trials run under similar conditions, the trial-to-trial reproducibility in the CWID slopes for both materials was similar. The occasional marked departure from a simplified model of atmospheric diffusion exhibited by one of the 2 materials in a given trial was duplicated in the same sense, and frequently to about the same extent by the other material. No significant difference was found between FP and SO_2 in atmospheric diffusion behavior.

Bureau of Yards and Docks, Washington, D. C.
CHEMICAL WARFARE DEFENSE. 1 July 55, 123p. 15 refs. Technical pub. NAVDOCKS TP-PL-3; BUDOCKSINST 3300.2.
Order from LC mi$6.30, ph$19.80 PB 142 889

Various phases of passive chemical warfare defense, including recovery and decontamination measures, are covered. Specifically, this publication presents information on the following subjects. (1) The most probable forms of attack by an enemy and the types and characteristics of the chemical warfare agents most likely to be used. (2) The fundamentals of a chemical warfare defense and recovery program. (3) A basis for organizing such a program. (4) Decontamination equipment, materials, and methods.

California U., Berkeley.
PARTICLE SIZE DISTRIBUTION MEASUREMENTS WITH ELECTRONIC INSTRUMENTATION BASED UPON LIGHT SCATTERING, by C. T. O'Konski, M. D. Bitron, and W. I. Higuchi. Technical rept. no. 3 on Contract Nonr-222(12). 1 Sep 56, 72p. 30 refs. AD-106 711.
Order from LC mi$4.50, ph$12.30 PB 128 512

A study has been made of the applicability of light scattering to the determination of concentrations and

size distributions in systems of spherical particles by combination of photometric and pulse analyzing instrumentation and methods. Relative scattering intensities for seven sizes of uniform latex aerosol particles in the range 0. 333 to 1. 17 μ diameter are reported. A brief resumé of previous work in this field is given, and the principal experimental considerations involved in the determination of size distribution spectra are discussed. Possible adaptations of the instrument are indicated.

Fluor Corp., Los Angeles, Calif.
THE APPLICABILITY OF COMBINING NUCLEAR REACTORS WITH SALINE WATER DISTILLATION PROCESSES STUDY OF, by D. B. Brice, M. R. Dusabek, and C. R. Townsend. Final rept. for 13 May-8 Nov 57 on OSW Contract 14-01-001-97. [1957] 220p. 12 refs. Research and Development Progress rept. no. 19.
Order from OTS $3. 50 PB 161 062

Fluor Corp., Ltd., Whittier, Calif.
OPTIMUM NUCLEAR REACTOR-SALINE WATER EVAPORATOR PROCESS: PRELIMINARY DESIGN STUDY, by D. B. Brice, M. R. Dusabek and others. Final rept. on OSW Contract 14-01-001-161. Aug 59, 255p. 55 refs. OSW Interim progress rept. no. 34; Fluor CRR no. 1046.
Order from OTS $4. 00 PB 161 010

The cost of potable water produced from sea water in a fifty-million gallons per day 52-stage flash evaporator, (when steam is supplied by a 370 thermal megawatt pressurized water nuclear steam generator) is estimated to be $0. 42 per thousand gallons ($136 per acre-foot). This estimated water cost includes all costs associated with the operation of the plant. Not only does it include amortization, energy and operating and maintenance costs, but also the cost of site preparation, submarine sea water lines and the equipment and energy required to make the water available at the site boundary at a pressure of 100 psig. The direct field cost of the plant is equivalent to $0. 73 per gallon per day and the total plant cost is equivalent to $0. 86 per gallon per day. The cost of steam from the nuclear steam generator is estimated to be $0. 37 per million BTU in the form of steam when all nuclear fuel costs, as well as capital and operating costs are included. The cost of converting sea water into potable water, as developed by this study, is sufficiently low to make it a potentially important source of supplemental water for many areas of the world.

Naval Research Lab., U. of Wisconsin, Madison.
THE RELATIONSHIP BETWEEN FUNDAMENTAL PHYSICS AND THE CHEMICAL ENGINEERING OF THE FUTURE, by Joseph O. Hirschfelder. Rept. on Contract DA 11-022-ORD-2526. 1 June 58, 14p. 1 ref. WIS-OOR-19; AD-137 092.
Order from LC mi$2. 40, ph$3. 30 PB 138 928

Engineers are concerned with the macroscopic, chemical, and physical properties of matter. However, under the extreme conditions of temperature, pressure or electromagnetic fields, the macroscopic properties must be understood in terms of either the properties of the individual molecules or in some cases the behavior of the electrons themselves. Examples are given to show that in the chemical engineering of the future, the intrinsic properties of molecules will play an increasingly important role. The four levels of research: Fundamental laws of physics, Properties and behavior of molecules, The macroscopic properties of materials, and Experiments designed to test or to apply our knowledge of physics are discussed.

Naval Research Lab., Washington, D. C.
THE VAPORATOR, A DEVICE FOR MEASURING THE VAPOR SOURCE STRENGTH OF CW-CONTAMINATED SURFACES. PART I. BACKGROUND AND PROTOTYPE, by G. H. Fielding. Interim rept. 13 Aug 59, 13p. 5 refs. NRL rept. 5361.
Order from OTS $0. 50 PB 151 935

The Vaporator is a small, lightweight device to be used with the Navy M-15 Chemical Agent Detector Kit for measuring the vapor source strength of CW-contaminated surfaces. The device is essentially a two-compartment metal cup, one part of which contains an activated-charcoal air filter. Using the rubber bulb of the M-15 kit, air is drawn at a fixed rate and in the desired volume through the charcoal and over a surface suspected of being contaminated. In this way, only purified air passes over the sample surface, and the test blank is zero. High sensitivity results from continuous sweeping of the sample surface with a current of air.

Civil Engineering

Army Engineer Waterways Experiment Station, Vicksburg, Miss.
FORECASTING TRAFFICABILITY OF SOILS: DEVELOPMENT AND TESTING OF SOME AVERAGE RELATIONS FOR PREDICTING SOIL MOISTURE. June 59, 219p. 23 refs. Technical memo. no. 3-331, rept. 5.
Order from LC mi$9.60, ph$33.30 PB 143 059

The average relations were tested on 24 sites that had been used in the development of prediction method, on 10 sites for which soil strength and moisture data were available, and on 617 sites located throughout the United States for which detailed data were not available. Predicted and measured values were compared, and the accuracy of prediction of soil moisture was within reasonable limits of error for well-drained soils. Appendices give the prediction method developed and a sample of its application, describe the 617 sites with limited data used in this investigation, and present results of special studies made to improve the accuracy of the prediction method.

Army Engineer Waterways Experiment Station, Vicksburg, Miss.
TRAFFICABILITY OF SOILS: TESTS ON COARSE-GRAINED SOILS WITH SELF-PROPELLED AND TOWED VEHICLES, 1956 AND 1957. June 59, 120p. Technical memo. no. 3-240, supplement 15.
Order from LC mi$6.00, ph$18.30 PB 143 060

Self-propelled, towing, and towed tests of several military vehicles were conducted on coarse-grained soils to correlate vehicle performance with strength (cone index) and moisture condition of the soil, and vehicle characteristics. Vehicle performance for self-propelled vehicles is expressed in terms of immobilizations and nonimmobilizations and ability to pull drawbar loads; for towed vehicles, in terms of towing-force requirements. Single self-propelled wheeled vehicles were tested on undisturbed coral and volcanic sands on Pacific islands, and on quartz sand (desert and beach) in the United States. Towing tests were conducted on harrowed sand at Yuma, Arizona; towed-vehicle tests were conducted on disturbed and undisturbed sand at Camp Lejeune, North Carolina. Principal conclusions are: (a) performance of single self-propelled vehicles can be expressed in cone index-slope climbing ability terms; (b) wet sands are more trafficable than dry-to-moist sands; (c) towing ability on harrowed sand slopes can be computed with reasonable accuracy from measurements obtained on level harrowed sand; and (d) towing-force requirements of wheeled trailers can be correlated with cone index and tire pressure.

Bureau of Yards and Docks, Washington, D. C.
ADMINISTRATION AND SECURITY FACILITIES. 1 Nov 53, 33p. 6 refs. NAVDOCKS Technical Pub. TP-Pw-24.
Order from LC mi$3.00, ph$6.30 PB 142 883

Presented herein are the technical criteria applicable to the design, construction, and maintenance of naval administration and security facilities, including administration and office buildings, post offices, fire stations, brigs, fences, and miscellaneous buildings and structures.

Bureau of Yards and Docks, Washington, D. C.
MEDICAL AND DENTAL FACILITIES. 15 Dec 53, 82p. NAVDOCKS Technical Pub. TP-Pw-22.
Order from LC mi$4.80, ph$13.80 PB 142 884

Presented herein are the technical criteria used in the design, planning, construction, and maintenance of medical and dental facilities. The four general subjects covered in this publication are naval hospitals, dispensaries, infirmaries, and dental facilities (clinics and departments).

Bureau of Yards and Docks, Washington, D. C.
PLANNING NAVAL SHORE ACTIVITIES. 22 June 54 reprinted 1 Feb 56. 80p. Technical pub. NAVDOCKS TP-PL-14 incl. Changes 1-4; BUDOCKSINST 11010.12.
Order from LC mi$4.50, ph$12.30 PB 142 887

This publication has been prepared for the use of all personnel concerned with the planning of naval shore activities and in particular with the preparation of Master Plans for the Naval Establishment, as required by the Master Shore Station Development Program. It provides both general and detailed information to be used as a guide in the preparation of Master Shore Station Development Plans, in order to promote uniformity in planning among field activities. In addition, it presents various aspects of shore activity planning that will provide guidance for the planner, whether architect or engineer, and for those who may have occasion to require the services of planners in the development of naval shore activities. This presentation will aid in effecting a better understanding of the nature of Navy planning problems and requirements.

Bureau of Yards and Docks, Washington, D. C.
TRAINING FACILITIES. 15 Mar 54, 70p. 2 refs. Technical pub. NAVDOCKS TP-Pw-17.
Order from LC mi$3.90, ph$10.80 PB 142 886

This publication provides criteria and establishes operational procedures to be used by personnel concerned with training facilities at naval shore activities. Part A presents the general authority and responsibilities of the Bureau of Yards and Docks for the design and construction of training facilities. Part B contains the basic site and layout requirements for Naval Training Stations. Part C is concerned with Marine Corps training facilities. Part D discusses Reserve Surface Training Centers for the Navy and for the Marine Corps. Part E sets forth the design and construction criteria for drill halls. Part F is concerned with indoor and outdoor practice target ranges.

Naval Civil Engineering Lab., Port Hueneme, Calif.
EVALUATION OF THE "WOOD HUENEME BUILDING", A 20-BY 48-FT STRAIGHT-SIDED, CABLE-ROOFED, PREFABRICATED STRUCTURE, by J. E. Dykins. 7 Aug 57, 29p. 4 refs. Technical memo. M-126.
Order from LC mi$2.70, ph$4.80 PB 142 899

The building had a gross cube of 288.5 cu ft and a gross weight of 11,250 pounds. It was erected in 128 manhours, using a six-man crew. Erection time did not include manhours required to insulate the building. The building was found adequate for a specified 15 psf snow load, 70 mph wind load, and 30 psf floor load.

Naval Civil Engineering Lab., Port Hueneme, Calif.
STRENGTH TESTS OF AIRCRAFT MOORING EYES IN CONCRETE PAVEMENT, by J. E. Smith and J. E. Schroeder. 15 Dec 58, 30p. 2 refs. Technical rept. R-014; AD-203 482.
Order from LC mi$2.70, ph$4.80 PB 138 700

Ninety-five percent of the failures occurred in the steel bars which form the mooring eyes. The holding capacity for each type varied from 12,000 to 70,000 lb depending upon the bar size of the mooring eye and the direction of pull. The two types of mooring eyes showed approximately the same strength characteristics for the various load conditions.

Electrical and Electronic Engineering

Aero Medical Lab., Wright Air Development Center, Wright-Patterson AFB, Ohio.
NATURE AND USE OF THE MAC-2 (MALFUNCTION AND CIRCUITRY) TRAINER, by Oliver K. Hansen, Paul E. Franks, and John A. Modrick. Rept.

on Human Factors in the Design of Devices for Maintenance and Ground Handling Training. May 59, 19p. 10 refs. WADC Technical note 59-140; AD-216 532.
Order from OTS $0.50 PB 161 032

Increases of costs and complexity of equipment have forced consideration of using simulators for maintenance training. The MAC-2 trainer, simulating the data flow of the MA-7A bomb-nav system, can be used for training and proficiency measurement in the use of data flow information and technical manuals by flightline mechanics. The report includes a brief history, physical and functional characteristics, purpose, advantages and limitations, suggested modifications, research problems and empirical basis for uses of the trainer. The trainer has considerable face validity but its specific purpose and the limited knowledge about its proper use should be considered in recommending this type of training equipment.

Air Force Cambridge Research Center, Bedford, Mass.
AIR FORCE CAMBRIDGE RESEARCH CENTER RADAR CROSS-SECTION MEASURING EQUIPMENT AND RANGE, by Benjamin B. Gorr. Apr 59, 34p. AFCRC TR-59-137; AD-214 844.
Order from LC mi$3.00, ph$6.30 PB 142 961

A continuous-wave radar set that automatically records backscattering radiation at frequencies of 9302.4 and 3100.8 Mcps is capable of plotting the return from the target for a full 360° of rotation in the plane of measurement. A target model introduced into the field of its electromagnetic horn antenna causes unbalance in a previously balanced hybrid junction in the antenna feed. The amplified unbalance signal, which is applied to a rectangular-coordinate recorder, is the function of the radar cross-section of the target. Construction and operation of the equipment is described.

Air Force Cambridge Research Center, Bedford, Mass.
COAXIAL CAPACITOR CIRCUITS WITH EXTREMELY SMALL INDUCTANCE, by Heinz Fischer. May 59, 15p. 5 refs. AFCRC TN-59-185; AD-215 062.
Order from LC mi$2.40, ph$3.30 PB 142 984

Capacitor circuits representing a transmission line and feeding coaxially into an arc chamber are described. Inductances of approximately 1.1×10^{-9} henry are obtained for the complete circuit which includes capacitor, termination, and arc gap. Current pulses within the proximity of 26,000 amp with a pulse width of 18 μsec are reported; the current rise is 2.8×10^{12} amp/sec. The complete apparatus weighs as little as 11 gm.

Air Force Cambridge Research Center, Bedford, Mass.
50-MCPS SIGNAL LEVEL MEASUREMENTS ALONG A 2000-MILE PATH, by A. S. Orange and T. F. Rogers. June 59, 52p. 5 refs. AFCRC-TR-59-148; AD-216 102.
Order from LC mi$3.60, ph$9.30 PB 143 190

The results of 50-Mc field strength measurements utilizing a high-power transmitter and airborne receiver are presented. While data concerning the line-of-sight, diffraction and extra-diffraction tropospheric fields are discussed, the investigation of ionospheric scatter propagation is emphasized. The distance dependence of the ionospheric scatter field is shown to be a decay of 1-3 db per 100 miles in the region of from 600 to 1400 miles distant from the transmitter (receiver altitude 25,000 ft). After 1400 miles, the field strength drops with increasing rapidity until it disappears into the ambient noise. A small diurnal dependence is observed in the field strengths, especially at extreme distances. For a few flights data concerning meteor burst enhancements are presented, with the emphasis on the distance dependence. The data are compared with that obtained by other experimenters and with theoretical predictions of the distance dependence of ionospheric scatter field strengths. The conclusion is reached that no simple model can explain the distance dependence observed.

Air Force Cambridge Research Center, Bedford, Mass.
PHASE-MODULATED ANTENNAS, by Charles J. Drane, Jr. Apr 59, 19p. 4 refs. AFCRC TR-59-138; AD-215 374.
Order from LC mi$2.40, ph$3.30 PB 142 962

The resolution of a passive antenna system can be improved through phase-modulation, cross correlation, and synchronous detection. Possible methods for constructing radiation patterns of the form (sin N kx) (N kx) by means of these techniques are presented. The relationship between the coefficients of a linear additive array and those of an equivalent product array is also stated.

Air Force Cambridge Research Center, Bedford, Mass.
PROJECTION DISPLAY SYSTEM FOR THE DEVELOPMENT OF THE AN/TSQ-13, by Hugh J. Sweeney and Wyatt R. Fox. Feb 59, 43p. 1 ref. AFCRC-TR-59-107; AD-209 904.
Order from LC mi$3.30, ph$7.80 PB 142 806

The projection display system, developed by Skiatron Electronics and Television Corporation under contract number AF 19(604)-1367, presents an expanded view of the air situation at an air control center in the Tactical Air Control System (Aircraft Direction and Reporting System, AN/TSQ-13). Although this display equipment performs the basic functions for which it was designed, a number of limitations were observes. Some of the basic weaknesses are: insufficient brightness and contrast, critical viewing angle, data insufficient and traffic load limit too low for comprehensible display, writing speed too slow due to screen material, and excessive delays and interruption in track data to write track number. Although some improvements may be made by redesign, the projection display system will be of doubtful operational value. Other approaches should be investigated before equipment of this type is considered further.

Air Force Cambridge Research Center, Bedford, Mass.
THEORETICAL CAPACITY OF INFORMATION SYSTEMS, by Charles F. Hobbs. Dec 57, 11p. AFCRC-TN-57-106; AD-146 783.
Order from LC mi$2.40, ph$3.30 PB 139 299

Use is made of the channel capacity formula

$$C = W \log (1 + S/N),$$

in comparing the relative effectiveness of increasing bandwidth or signal power on the channel capacity of an information system. Two cases are treated: (1) constant noise-per-unit bandwidth and (2) constant channel noise. It is shown for the first case that to avoid a saturation effect both bandwidth and signal power should be increased in such a way that

$$\frac{S}{Wn} = S/N$$

is maintained approximately constant. For the second case, increasing signal power alone is more effective at low S/N, whereas the relative effect of increasing bandwidth is independent of S/N.

Armour Research Foundation, Chicago, Ill.
A STUDY OF CRYSTAL OSCILLATOR CIRCUITS, by H. E. Gruen and A. O. Plait. Quarterly progress rept. no. 7, 15 Nov 56-15 Feb 57, on Contract DA 36-039-sc-64609. [1957] 66p. 7 refs.
Order from LC mi$3.90, ph$10.80 PB 142 865

A complete design method is presented for the Cathode Coupled crystal oscillator, operating in the frequency range of 75 to 150 mc. Design information is presented in the form of graphs and tables. A reference circuit, having a single set of values for the frequency range covered has been devised, and by varying the circuit component values, performance has been determined and plotted. The resulting graphs are normalized with respect to the reference circuit component value and performance figure. In this way, output and crystal drive voltage variations were determined for specific changes in circuit parameters. The design method thus developed provides output prediction with an accuracy of approximately 10 to 15 percent for changes in any one component. Accuracy of crystal drive voltage prediction is in the order of 20 to 30 percent for the same conditions. Work on the Capacitance Transformer Coupled oscillator using subminiature filament-type tubes has been completed, and performance of this oscillator at 105, 135, and 150 mc is presented. Performance of this circuit is comparable to that of circuits using cathode-type tubes considering the lower transconductance of available filament-type tubes. Investigation of the two selected oscillator circuits in the frequency range of 10 to 75 mc has begun and certain characteristics peculiar to the lower frequency circuits are discussed. (See also PB 142 169)

Army Engineer Research and Development Labs., Fort Belvoir, Va.
IMAGE INTENSIFIER SYMPOSIUM, OCTOBER 6-7, 1958. 1958, 310p. 90 refs.
Order from OTS $5.00 PB 151 813

Contents:
Image converter tube intensifier research
Image intensifier research in Europe
Image orthicon intensifier research
Applications, special problems, and programs for image intensifiers in

Army [Rocket and Guided] Missile Agency, Redstone Arsenal, Ala.
TRANSISTOR CIRCUITS ALTER FREQUENCY RESPONSE OF MAGNETIC AMPLIFIERS, by James C. Taylor and Charles L. Wyman. 10 Feb 58, 19p. 10 refs. Rept. no. DG-R-41.
Order from LC mi$2.40, ph$3.30 PB 139 260

This report is a discussion of an improved method of shaping the frequency response of magnetic amplifiers. Transistor circuits furnish the power for lead or lag characteristics with negligible effect on magnetic amplifier gain or drift.

Army Signal Missile Support Agency, White Sands Missile Range, N. Mex.
LABORATORY INVESTIGATION OF BABCOCK RADIO CORP. BCR-21 RECEIVER, by Gust E. Johnson, William E. Castilo and Merwin A. Olson. 2 Sep 58, 61p. AFC Rept. DC 2-9-58 RdeC.
Order from LC mi$3.90, ph$10.80 PB 139 266

Results are presented on a laboratory investigation of the interference susceptibilities of a BCR-21 Tow Target Control Receiver. This receiver will operate in the frequency band: 225 - 400 MCS. The operational characteristics of sensitivity, selectivity, spurious responses, spurious emissions, modulation sensitivity, audio selectivity, VSWR, interference characteristics and battery life were examined against operating time, temperature, and pressure. For protection of this equipment against potential interference sources in the White Sands Missile Range, a 2 1/2 MCS clear channel (/ 1/2 MCS and -2 MCS) should be maintained for J/S ratio of less than or equal to /20 db. This also allows for frequency drift.

Army Signal Research and Development Lab., Fort Monmouth, N. J.
INTERFERENCE SUSCEPTIBILITY INVESTIGATION OF RADIOSONDE SET AN/AMQ-9, by Leroy Hutson. June 58, 33p. 1 ref. USASRDL Technical rept. 1967.
Order from LC mi$3.00, ph$6.30 PB 139 225

Bench tests on an analogue superregenerative receiver indicated that a change from logarithmic to linear operation improves the interference rejection of the superregenerative receiver to an unmodulated cw carrier. The relative improvement varies from some 3.5 db. with the jamming signal at center frequency to 27.5 db. if the jamming signal is offset 2% from the receiver center frequency. The improvement designated above reters to a weak desired signal of 11 microvolts. If the desired signal is strong and on the order of 150 microvolts, the relative improvement of the linear receiver varies from 4 db. to 14.5 db. for the same frequency deviation. The superregenerative receiver was, of course, tuned to the desired frequency at all times. A technique that resulted in improving the interference rejection ability of the superregenerative receiver in both the logarithmic and linear modes of operation was that of frequency

modulating the carrier frequency of the desired signal above and below the center frequency of the receiver.

Austin Co., New York.
AUTOMATIC DATA RECORDER TYPE 100-A MODEL 0, by C. D. Cole. Final rept. on Contract DA 36-039-sc-42721. 15 Mar 56, 26p. AD-143 838.
Order from LC mi$2.70, ph$4.80 PB 138 661

The function of this device is to receive data, from as many as five separate radar sources, in the form of a continuous train of pulses. This pulse train is then reduced into a count whose number is proportional to the angular position of the radar shaft. The information obtained is instantaneously stored on magnetic tape. A very slow playback system is also incorporated so that the stored information can be fed into a card punching machine or tape punching machine. This report contains the major design portions of the equipment and some of the theory of operation of these units is included. Photographs of important waveforms and a simplified block diagram is also included. The resolution of the system for azimuth and elevation is 0.1 mil and the static and dynamic accuracy is ±0.2 mils. The resolution for range is 1 yard and the static and dynamic accuracy is±2 yards.

Ballistic Research Labs., Aberdeen Proving Ground Md.
CALCULATION OF DOVAP REFERENCE SIGNAL REFLECTED FROM ROCKETS, by V. Richard. Oct 57, 12p. 2 refs. Technical note no. 1143; AD-147 151.
Order from LC mi$2.40, ph$3.30 PB 139 241

Calculations of reflected 37mc reference signal from a rocket at altitudes up to 5000 feet are compared with direct ground reference signals. Different combinations of soil, sea water, receiving antenna polarization and elevation up to 100 feet are considered. The results show that the direct signal is larger than the reflected signal under conditions of vertical polarization and sea water or with good soil and a receiving antenna elevation of 100 feet. Locating the rocket launcher as far from the transmitter as possible is desirable to reduce the reflected signal. A minimum spacing of 500 feet is recommended. Since the reflected signal is predicted to be less than the direct signal, there should be no cumulative Doppler cycle error.

California Inst. of Tech. [Pasadena].
A NEW TRANSMITTING ANTENNA SYSTEM FOR VERY LOW RADIO FREQUENCIES, by Willard Van Tuyl Rusch. Technical rept. no. 4 on Contract AF 18(600)1552. 26 June 59, 167p. 32 refs. AFOSR TN-59-582; AD-217 029.
Order from LC mi$7.80, ph$25.80 PB 142 988

The theoretical antenna problem is solved using a normal mode expansion of the current distribution. A matrix method is developed to compute the current distribution of a thin, linear antenna loaded with lumped-circuit elements. The series is found to converge relatively fast. A digital computer is used to solve the matrix equations. Results are obtained for a full-wave linear antenna symmetrically loaded with real impedances Z_o, one half-wavelength apart. Current distributions, feedpoint impedances, radiation patterns, etc., are presented as functions of Z_o. Results of the idealized problem are applied to the power-line antenna. The matrix method can also be extended to the general linear antenna with any type of loading or feeding. System components and performance of the Dinkey Creek power-line antenna are described. The problem of interference with nearby audio-frequency communication systems is examined.

Case Inst. of Tech., Cleveland, Ohio.
SEMI-ANNUAL REPORT. Scientific rept. no. 4 on Contract AF 19(604)3887. 1 June 59, 30p. 14 refs. AFCRC TN-59-570.
Order from LC mi$2.70, ph$4.80 PB 143 191

Contents:
Anisotropic properties of artificial dielectric media
Diffraction phenomena
Solid angle synthesis
(See also PB 142 026)

Columbia U. School of Engineering, New York.
FIDELITY OF A COMMUNICATION SYSTEM AFFECTED BY ATMOSPHERIC TURBULENCE WITH APPLICATION TO LONG LINE-OF-SIGHT RADIO LINKS, by Dimitri S. Bugnolo. Technical rept. T-2/C on Contract AF 49(638)350. 27 Oct 58, 25p. 12 refs. CU-3-58-AF-350-EE; AFOSR-TN-58-968; AD-205 603
Order from LC mi$2.70, ph$4.80 PB 138 742

The fidelity or mean squared error of a communication system affected by atmospheric turbulence is considered in detail. In particular the results of a general analysis are applied to the special case of a band-limited long-line-of-sight radio link. For this case it will be shown that the fidelity or mean squared error is directly proportional to band width.

Cornell Aeronautical Lab., Inc., Buffalo, N. Y.
DEVELOPMENT AND APPLICATION OF A THERMAL DIODE "THERMATRON" FOR USE IN STUDYING METHODS OF COOLING ELECTRON TUBES, by James P. Welsh. Rept. on Contract NObsr-72531. 1 May 57, 70p. 9 refs. Rept. no. HF-1053-D-3.
Order from LC mi$3.90, ph$10.80 PB 143 085

This Manual was prepared under the sponsorship of the Dept. of the Navy, Bureau of Ships as part of a continuing study of methods of cooling electronic equipment. The findings of investigations of the heat flow paths within and adjacent to vacuum tubes are incorporated herein together with the history of the development of the Thermatron diode and its application to the study of vacuum tube cooling techniques. In particular, it has been found that bulb temperature is not a reliable index of the thermal condition of a glass vacuum tube. The Thermatron permits the measurement of plate temperature and is recommended for use in determining the thermal effectiveness of vacuum tube cooling techniques.

Cornell Aeronautical Lab., Inc., Buffalo, N. Y.
STUDY OF METHODS OF COOLING SEMICONDUCTOR DEVICES, by James P. Welsh. Quarterly technical note for Dec 58-Feb 59 on Contract AF 30(602)1842. [1959] 13p. 13 refs. Rept. no. HM-1247-D-3; RADC-TN-59-243.
Order from LC mi$2.40, ph$3.30 PB 142 943

The first draft of the handbook was prepared. In addition to an analysis of proper cooling techniques, a study has been made of methods of improving fabrication techniques for transistors. The findings, if followed, may enhance the electrical reliability and lifetime of semiconductor devices. Also, patent disclosures have been made on a liquid-filled transistor, a Peltier-cooled transistor, and a Peltier-cooled Zener diode.

Dalmo Victor Co., Belmont, Calif.
THEORETICAL AND EXPERIMENTAL INVESTIGATIONS TO DEVISE METHODS FOR OBTAINING DYNAMIC PATTERN DATA FOR ANTENNA SYSTEMS, by Robert W. Thille, Clarence A. Andrews and others. Final rept. on Contract AF 19(604)2637. 16 June 59, 202p. 1 ref. AFCRC TR-59-163.
Order from LC mi$9.30, ph$31.80 PB 142 999

The purpose of this report is to describe a system that has been devised to determine pattern shape information for the antenna associated with a particular type of ground based, medium range radar. The information that has been gathered in evaluating three of these antennas located in different areas is also included along with a detailed discussion of these data. It was determined that several types of man made and natural obstructions had a noticeable effect on the radiation characteristics of these antennas. It was also noted that the radiation characteristics of the antenna varied as a function of time. This seems to imply not only the necessity of evaluating an antenna after it has been installed at a site, but also it may be advisable to evaluate these operational antennas on a continuous basis or at certain time intervals. The proper evaluate these operational antennas on a continuous basis or at certain time intervals. The proper evaluating program would depend on the magnitude and the rapidity of the change of the pertinent antenna characteristics as a function of time.

Dayton U., Ohio
A STUDY OF ENVIRONMENTAL TEMPERATURE AND PRESSURE EFFECTS ON THE PLATE DISSIPATION RATING OF RECEIVING TUBES, by Bernhard M. Schmidt. Rept on Electronic Tubes and Transistors, Contract AF 33(616)3258. Dec 57, 54p. WADC Technical rept. 53-433, Pt. 3; AD-151 187.
Order from OTS $1.50 PB 131 976

This report describes life tests involving statistically meaningful samples of tubes operated under conditions specified by the previously established extrapolation curves. Results are compared to those obtained for a concurrently tested control group operated under normal environmental conditions. A representative miniature electron tube and a representative subminiature electron tube were studied. Such life tests were performed to test the validity of the extrapolation curves presented in the previous sections of this report. Strict interpretation of experimental results indicates that the extrapolation curves describe operating conditions that are more severe than those existing under normal conditions. It is concluded that, in general, the hypothesis of plate dissipation rating extrapolation fails, but that the earlier material still may provide useful information to the equipment designer if used with discretion. A maximum hot spot temperature limit is indicated and evidence of significant electrolysis in the glass at high temperature is presented.

Diamond Ordnance Fuze Lab., Washington, D. C.
ADDITIONAL NOTES AND EXPERIMENTAL DATA ON THE TRANSMISSION-TYPE FERRITE PHASE MODULATOR WITH A METHOD OF CHECKING PM/AM RATIO, by H. B. Bruns. 15 Jan 58, 11p. TR-562.
Order from LC mi$2.40, ph$3.30 PB 138 893

The DOFL transmission-type ferrite phase modulator discussed in a previous report (DOFL TR-206 - dated August 1955), has been utilized in testing Doppler sensitive systems other than the FM-CW type. Also data are presented which show the improvement in the sensitivity variation obtained when a 60-cycle modulation is used in addition to the Doppler frequency modulation. Also presented is a method for the measurement of the PM/AM ratio of the modulator output.

Diamond Ordnance Fuze Labs., Washington, D. C.
VISUAL INSPECTION STANDARDS FOR SOLDERING, by W. A. Atwell. 18 Apr 58, 13p. 5 refs. TR-590.
Order from LC mi$2.40, ph$3.30 PB 138 892

These soldering inspection standards with illustrations have been established for use at the Diamond Ordnance Fuze Laboratories to assist in the determination of acceptable solder joints in electronic equipment.

Eastman Kodak Co., Rochester, N. Y.
DEVELOPMENT OF AMMONIA VAPOR ACTIVATED BATTERIES, by V. M. Bryant, Jr., B. K. Burke and V. D. Schliff. Quarterly rept. no. 6, 1 Oct-31 Dec 58, on Development of XM-AVA-1 and XM-AVA-2 Batteries, Contract DA 36-039-sc-71232. [1959] 53p.
Order from LC mi$3.60, ph$9.30 PB 142 863

Task A (High Rate Battery): work accomplished on: Battery Stack-Activated Stand Time, properties of impregnated electrolyte pads; Stack Components; Activator; Case. Task B (Low Rate Battery): Battery Stack-Electrolyte vehicle; Activator; Package-A-Section, B_2-Section. (See also PB 139 061)

Eastman Kodak Co., Rochester, N. Y.
DEVELOPMENT OF AMMONIA VAPOR ACTIVATED BATTERIES, by V. M. Bryant, Jr., B. K. Burke and J. B. Schliff. Quarterly rept. no. 7, 1 July-30 Sep 58, on Development of XM-AVA-1 and XM-AVA-2 Batteries, Contract DA 36-039-sc-71232. [1958] 48p. 2 refs.
Order from LC mi$3.30, ph$7.80 PB 139 061

Task A (High rate battery). Report of work progress accomplished on the following phases: Testing and experiments: special test apparatus-finned-tube-simulator; battery stack-properties of impregnated electrolyte pads, preliminary investigation of electrode material; Design evaluation: package assemblies; Redesign and evaluation: stack components; activator; case. Task B (Low rate battery). Report of work progress on the following phases: Testing and experiments: special test apparatus-"Cold bottle" test apparatus; battery stack-electrolyte vehicle; activator; package-A-Section, B_2-Section. (See also PB 137 495)

Electrical Engineering Research Lab., U. of Illinois, Urbana.
INVESTIGATION OF MICROWAVE DUPLEXER SWITCHING MECHANISMS, by L. Goldstein, A. Aharoni and others. Quarterly progress rept. no. 6, 1 Aug-31 Oct 58, on Contract DA 36-039-sc-73150. 30 Jan 59, 32p. 5 refs.
Order from LC mi$3.00, ph$6.30 PB 142 996

Experimental results are reported (a) on electron-loss processes in decaying plasma produced in water vapor, (b) on electron-water vapor molecule momentum transfer collision cross sections at 300°K, (c) on the electron-positive ion recombination coefficient at 300°K and its variation with various factors. With regard to (a) it is found that the main electron removal process in water vapor disintegrating plasma is recombination rather than electron attachment. Recombination coefficients varying from 10^{-5} cm^3/sec to about 10^{-6} cm^3/sec are found. It appears from these results that the electron attachment probability in H^2O for electrons of mean energy of 0.04 eV is less than 10^{-7}. The momentum transfer collision cross section of water vapor molecules for electrons of an electron gas at 300°K $Q_m = (6.8 \pm 1.4) \times 10^{-14}$ cm^2. This cross section is decreasing sharply with increasing electron energy. Investigation of semiconductor properties in microwave (8 mm) fields have been continued. (See also PB 140 807)

Electrical Engineering Research Lab., U. of Illinois, Urbana.
NEW TECHNIQUES FOR REALIZATION OF TRANSFER FUNCTIONS, by Seifollah Louis Hakimi. Doctoral thesis. Interim technical rept. no. 12 on Contract DA 11-022-ORD-1983. 30 Jan 59, 78p. 29 refs. AD-210 755.
Order from LC mi$4.50, ph$12.30 PB 143 087

DeClaris has shown that the transfer function of a network consisting of resistors, capacitors, and one inductor has no more than one pair of complex conjugate poles. It is shown in this thesis that for every transfer function that is realizable as a grounded two terminal-pair RLC network and that has only one pair of complex conjugate poles, a grounded two terminal-pair network can be found which realizes the given function within a constant multiplier and which contains only one inductor.

Electro Engineering Products, Inc., Chicago, Ill.
DYNAMOTOR POWER SUPPLY FOR BEACON, RADIO AN/DPN-19 AND AN/DPN-32, by R. F. Williams. Final rept. for 27 Apr 55-1 Feb 57 on Contract DA 36-039-sc-64690. [1957] 45p.
Order from LC mi$3.30, ph$7.80 PB 138 895

Investigations were conducted on the development of a power supply employing a miniaturized dynamotor, filter, switches, and other components for the supply of adequate voltages to cause satisfactory operation of radio beacon DPN-19 and DPN-32. A change was made in the dynamotor from dual output to single output. This variation was based on the addition of a battery bias supply with the dynamotor supplying only the high-voltage requirements. The single-output dynamotor proved to be producible under production type methods. A fool-proof switching mechanism was developed that proved to be ideal for performing a switching operation under severe conditions of vibration, shock, and physical stress. Some difficulty was experienced in obtaining consistent filter behavior to prevent variation in the ripple voltage in the output circuit. From observance of the voltage waveform, it was found that the capacitors used were not consistently of the same values. Objectionable ripple output was attributed to the armature of the dynamotor running too fast. This was a difficulty found to exist in the process of charging the magnets after assembly. Only partially charged, these units caused excessive ripple and deleterious waveforms.

Electro-Mechanical Research, Inc., Sarasota, Fla.
TELEMETRY SYSTEMS FM/FM, by Foster N. Reynolds. Final engineering rept. on Contract AF 08(606)1168. 18 Apr 58, 5p. AFMTC-TR-58-12; AD-134 285.
Order from LC mi$1.80, ph$1.80 PB 143 234

Electronic Components Lab., Wright Air Development Center, Wright-Patterson AFB, Ohio.
VARIABLE-REACTANCE PARAMETRIC AMPLIFIERS: A SELECTED BIBLIOGRAPHY, by Elden K. Shaw. Rept. on Improved Electronic Components. Mar 59, 10p. 39 refs. WADC Technical note 59-90; AD 212 563
Order from OTS $0.50 PB 151 965

This report presents a selection of current bibliographical references in the field of variable-reactance parametric amplifiers. Included is a table summarizing the electrical characteristics of parametric amplifiers which have actually been constructed and the references from which the data were taken. The references selected pertain only to parametric amplifiers using the variable capacitance of semiconductor diodes as the active element.

Electronics Research Labs., Columbia U., New York.
THE ESTIMATION OF THE AUTOCORRELATION FUNCTION OF A STATIONARY GAUSSIAN PROCESS, by H. Dern. Technical rept. T-12/133 on Contract AF 19(604)1572. 22 Sep 58, 39p. 4 refs. CU-19-58-AF-1572-ERL; AFCRC TN-58-558; AD-160 867.
Order from LC mi$3.00, ph$6.30 PB 139 273

The estimation of the autocorrelation function of a class of stationary, Gaussian processes of mean not necessarily zero is considered. It is shown that for the class of continuous (in time) processes whose

mean zero parts have (a) absolutely integrable and square integrable autocorrelation functions, and (b) spectral density functions $S_y(f)$ such that $\sum_{k=-\infty}^{\infty} S_y(f + kf_o)$ exists for all f and all $f_o > 0$, that when the sample autocorrelation function is used as a point estimator, this estimate is unbiased and asymptotically consistent. A number of numerical cases, using artificially generated data, are worked out to show the behavior of the procedure in some typical cases. In the course of the analysis, the expression for the fourth moment about zero of a Gaussian process is derived (Appendix A). The relationship between the autocorrelation function and the spectral density of a time series is also derived in a manner which is somewhat more appealing in an engineering context than that usually followed in works on statistics (Appendix C).

General Electric Microwave Lab., Palo Alto, Calif.
MEASUREMENT AND CONTROL OF HARMONIC AND SPURIOUS MICROWAVE ENERGY, by Vernon G. Price, Richard H. Stone, and John P. Rooney. Final rept. Phase 2 on Contract AF 30(602)1670. 10 Mar 59, 113p. 36 refs. Rept. TIS R59EMH112-2; RADC TR-59-59; AD-214 430.
Order from LC mi$6.00, ph$18 30 PB 142 935

With the objective of reducing unwanted microwave r-f radiations to a negligible value, filter specifications with regard to such factors as stop band insertion loss, power handling capacity, and pass band characteristics were determined, and the state of the art was reviewed for applicable filter types. The filter mechanisms which were selected for study were the coupled resonator filters, the corrugated waveguide filters, the higher mode resonance filters, and the absorptive type filters (1) based on directional couplers, (2) using ferrite materials and (3) using the leaky wall principle. Each of the types considered can find successful applications, but the leaky wall absorptive type is the most promising for use in high power systems and, therefore, was studied at greater length. Each type of filter is described herein and the advantages and shortcomings of each are discussed.

General Electronic Labs., Inc., Cambridge, Mass.
INTERMEDIATE FREQUENCY AMPLIFIERS, by A. W. Pearson. Final technical rept. for 1 July 54-1 July 57 on Contract DA 36-039-sc-64455. 1957, 171p. 1 ref. AD 147 253.
Order from LC mi$8.10, ph$27.30 PB 143 358

Small-size, very high gain, high-level-output intermediate frequency amplifiers for use in radio interference measuring sets were designed and constructed. Results of the study and design phases are given. Recommendations for electronic and constructural modifications which will result in better production results are made. The factual data section includes (1) a description of the study program, (2) a detailed description of the Type A amplifier, and (3) a detailed description of the Type B amplifiers.

General Radio Co., Cambridge, Mass.
FREQUENCY CONTROL SYSTEMS, by R. W. Frank and R. W. Stuart. Quarterly progress rept. no. 5, Aug-1 Nov 53, on Investigation of Circuits for the Purpose of Crystal Elimination, Contract DA 36-039-sc-15542. Nov 53, 23p. 1 ref.
Order from LC mi$2.70, ph$4.80 PB 139 395

An examination has been made of various methods of improving the performance of the original model. A design method for improving the "Scale-of-N" counter has been proposed, and possibilities for economies in the counter discussed. The replacement of the Increductor oscillator with an LC oscillator has been suggested, the LC oscillator to be rough tuned with a frequency discriminator and servo motor. A low noise phase detector for controlling phase locking has been discussed for the purpose of reducing f-m noise in the output, and reducing attenuation requirements on the low-pass filter.

Georgia Inst. of Tech. Engineering Experiment Station, Atlanta.
INVESTIGATION AND STUDY OF COMMUNICATION INTERFERENCE REDUCTION TECHNIQUES, by B. L. Blanks, W. R. Free and others. Final rept. for 1 Dec 56-31 Jan 58 on Contract AF 30(602)1638. [1958] 238p. 23 refs. RADC-TR-58-104; AD-148 844.
Order from LC mi$10.20, ph$36.30 PB 138 923

Three interference reducing techniques were investigated and results of the application of these techniques on a R361A/GR receiver were observed. These techniques were (1) fixed bias operation of r-f amplifiers and mixers, (2) use of plate mixer, and (3) AVC action by linear UHF attenuation. Third, fifth- and seventh-order intermodulation rejection properties were obtained on several currently available VHF and UHF tubes used as r-f amplifiers and mixers. An analytic technique was developed to mathematically investigate tube non-linearities and a program was devised to employ the IBM 650 magnetic-drum computer. A ferrite continuously variable linear attenuator was developed to provide AVC action on input UHF signals.

Georgia Inst. of Tech. Engineering Experiment Station, Atlanta.
STUDY OF AGING EFFECTS OF QUARTZ CRYSTAL PLATES, by R. P. Belser and J. P. Kittel. Quarterly rept. no. 2, 1 Nov 57-31 Jan 58, on Contract DA 36-039-sc-74946. [1958] 13p.
Order from LC mi$2.40, ph$3.30 PB 142 620

Frequency measurements of 60 quartz resonator units have been continued and additional units, mounted in glass containers, have been fabricated. (See also PB 142 619)

Georgia Inst. of Tech. Engineering Experiment Station, Atlanta.
STUDY OF AGING EFFECTS OF QUARTZ CRYSTAL PLATES, by R. B. Belser and W. H. Hicklin. Quarterly rept. no. 3, 1 Feb-1 May 58, on Contract DA 36-039-sc-74946. [1958] 25p.
Order from LC mi$2.70, ph$4.80 PB 142 621

Additional units were base plated with evaporated gold and plated to frequency by overplating with evaporated gold. Five units mounted in glass were exceptionally stable indicating that over-plating is not, intrinsically, a frequency degrading technique. (See also PB 142 620)

Georgia Inst. of Tech. Engineering Experiment Station, Atlanta.
STUDY OF AGING EFFECTS OF QUARTZ CRYSTAL PLATES, by R. B. Belser and W. H. Hicklin. Final rept. for 1 Aug 57-31 July 58 on Contract DA 36-039-sc-74946. [1958] 56p. 3 refs.
Order from LC mi$3.60, ph$9.30 PB 142 630

Ten resonators plated by evaporation of a single coat of silver on the hot (200°C) quartz substrate mounted in the HC-6/U container exhibited stabilities nearly equivalent to the gold plated resonators. The value of the glass containers for both experimental studies and practical use is that it is not subject to the development of micropores with time; the development of these appears to be an intrinsic weakness of the HC-6/U containers as now designed and sealed. (See also PB 142 621)

Glenco Corp., Metuchen, N. J.
CAPACITORS, CLOSE TOLERANCE, TEMPERATURE COMPENSATING, by Norman Rudnick. Final rept. for 15 May 55-19 Oct 56, on Contract DA 36-039-sc-64685. [1956] 114p. AD-142 733.
Order from LC mi$6.00, ph$18.30 PB 138 680

Revision of equipment: New sample holders were designed and constructed with excellent seals against vapor, more rigid structures, more convenient electrical connections, and greatly improved thermal contact with the heat transfer liquid. Reevaluation of old bodies: Previous temperature compensating ceramic compositions were tested for curvature of the capacitance-temperature characteristics over the 100° to -55°C range; insulation resistance vs temperature up to over 200°C; and for performance on (1) 9-day accelerated life tests, with temperatures up to 140° and with up to 7 times the rated voltages, and (2) conventional 1000 hr tests at twice the rated voltage and 100°C. Coating: An excellent system was developed for dipping the ceramic plates in molten glass to give a fused protective layer impervious to moisture and unaffected by thermal expansion. This coating has less effect on the over-all temperature coefficient of capacitance, provides a unified structure, and suppresses corona effects at points of greatest electrical stress. Development of new bodies: Several unsuccessful attempts were made to modify the ceramic composition.

Glenco Corp., Metuchen, N. J.
CAPACITORS, CLOSE TOLERANCE, TEMPERATURE COMPENSATING, by Norman Rudnick. Supplement to Final rept. on Contract DA 36-039-sc-64685. 17 June 57, 12p. AD-142734.
Order from LC mi$2.40, ph$3.30 PB 138 662

Temperature coefficients of capacitance, and loss tangent data are tabulated for 125 glass coated capacitors. The capacitance and loss tangent were measured at 1 mc with a General Radio 716-CSl bridge. The temperature coefficients were determined at 1 mc with the Glennite Incremental Capacitance Ratio Bridge. The glass coated ceramic dielectric TC capacitor is a reliable high quality device at elevated temperatures. However, neither the glass coatings nor the attempted ceramic revisions gave the desired close tolerences on temperature coefficients over the 100° to -55°C range. Up to the N150 the tolerances are feasible: N150 is a borderline case. (See also PB 138 680)

Hycon Eastern, Inc., Cambridge, Mass.
SEMI-ANNUAL INTERIM ENGINEERING REPORT, NO. 1, by J. L. Burkhardt. Rept. on Contract AF 30(602)1642. 25 Dec 57, 12p. 3 refs. HEI rept. no. M-483; RADC-TN-58-88; AD-148 658.
Order from LC mi$2.40, ph$3.30 PB 139 007

Circuit properties of maser amplifiers have been studied. The reflection cavity configuration appears to be preferable to the transmission cavity and adiabatic fast passage is the preferred activation technique. Problems of gain stabilization and activation instability have been solved by a simple technique involving control of magnetic field inhomogeneity.

Lavoie Labs., Inc., Morganville, N. J.
THE DEVELOPMENT OF THE FREQUENCY METER AN/URM-81. Final rept. for 28 Feb 52-Apr 55 on Contract DA 36-039-sc-36522. [1955] 46p.
Order from LC mi$3.30, ph$7.80 PB 139 086

The report covers the development of a frequency meter covering from 100 to 500 megacycles, with an accuracy of 0.001%. During the development period, new components were developed and techniques for calibration and temperature control established. A relatively new system of frequency measurement was applied to a single-unit instrument which resulted in a reduction of ambiguity to the vanishing point. By the use of individual subchassis, each comprising a major system element, manufacture and test of the instrument was simplified, and production lead time was reduced. The large number of calibration points required that standard mechanical calibration methods be discarded and a high speed continuous film strip calibrator be developed.

Lincoln Lab., Mass. Inst. of Tech., Cambridge.
AN FM MTI CANCELLATION SYSTEM, by D. A. McKee. Rept. on Contract AF 19(122)458. 8 Jan 58, 31p. 5 refs. Technical rept. no. 171; AD-110 036.
Order from LC mi$3.00, ph$6.30 PB 139 237

A 40-Mcps, two mixer FM cancellation system is described. Three 1667-μsec delay lines of different quality were used to provide a comparison of delay-line spurious response and cancellation ratio. A 3333-μsec system was built using two lines in cascade. The following cancellation ratios were obtained:

		Cancellation Ratio (db)		Σ Spurious
Line	PRD	6-μsec	0.5-μsec	(db)
1	600	33	25	24
2	600	40	28	26
3	600	45	28	30
2+3	300	35	25	23

A complete set of waveforms is provided illustrating the pulse response and pass band at points of interest in the system.

Lincoln Lab., Mass. Inst. of Tech., Lexington.
ONE-MEGACYCLE SILICON TRANSISTOR CIRCUITS APPLICABLE TO AIRBORNE DIGITAL SYSTEMS, by V. J. Sferrino and W. G. Schmidt. Rept. on Contract AF 19(122)458. 10 Mar 58, 33p. Technical rept. no. 177; AD-110 045.
Order from LC mi$3.00, ph$6.30 PB 139 205

This report describes a group of circuits employing silicon semiconductor devices for use in digital systems operating in temperature environments between -55°C and +100°C. The designs emphasize simplicity, reliability, economy of power, versatility, and minimum sensitivity to variations among transistor parameters. These circuits have undergone extensive temperature tests within the prescribed limits, both as individual units and as components in logical subsystems. Minimum specifications of circuit performance within these temperature limits are presented.

Lincoln Lab., Mass. Inst. of Tech., Cambridge.
A SEARCH FOR MEANS TO DETECT DISTANT, LOW-FLYING AIRCRAFT, by Eugene W. Pike. Rept. on Contract AF 19(122)458. 18 July 57, 11p. 120 refs. Technical rept. no. 161; AD-150 868.
Order from LC mi$6.00, ph$18.30 PB 142 919

The problem set is the detection, by a ground-based observer, of an aircraft 40 miles distant, perhaps 100 feet above the terrain, and at least 1000 feet below the observer's mask. The systems studied are based on the following interactions: static gravitational force; vector gravitational force; scattering of cosmic rays; sound generated by lift forces; engine and propeller noise, turbulence noise of heavy aircraft; ferromagnetic fields; aircraft electrostatic charge and the moving-charge field; induction effects (eddy currents); magnetic fields of aircraft machinery; eddy currents in the airframe from maneuvers in the earth's field; reflection of diffracted and scattered electromagnetic waves, radar frequency; reflection of sunlight, followed by scatter propagation to the observer; scatter propagation of infrared radiation from aircraft, reflection of scattered ultraviolet light.

Lincoln Lab., Mass. Inst. of Tech., Cambridge.
THEORY OF NONRECIPROCAL FERRITE PHASE SHIFTERS IN DIELECTRIC-LOADED COAXIAL LINE, by K. J. Button. Rept. on Contract AF 19(122) 458. 7 Mar 58, 9p. 6 refs. Technical rept. no. 176; AD-110 044.
Order from LC mi$1.80, ph$1.80 PB 139 236

The four necessary physical conditions have been established theoretically to achieve high-performance nonreciprocal coaxial devices for use at low microwave frequencies and in the UHF region. Theoretical differential phase shift of 180° per inch of line length has been obtained in the 3000-Mcps range. The exact electromagnetic field patterns of the parallel-plate analog of the coaxial line have been plotted. The conditions for the efficient operation of a ferrite-loaded coaxial resonance isolator have been described.

Mallory, P. R., and Co., Indianapolis, Ind.
HIGH STABILITY MINIATURIZED TRIMMER CAPACITORS, by C. W. Everhart and B. L. Borman. Final rept. for 15 Oct 55-15 Oct 56 on Contract DA 36-039-sc-70153. 1956, 76p. 52 refs. AD-156 954.
Order from LC mi$4.50, ph$12.30 PB 143 301

The objective of this study is the development of a highly stable, highly miniaturized line of trimmer capacitors to replace the variety of existing types. These capacitors must exhibit good temperature and mechanical stability, and a high order of ruggedness and reliability under the combination of environmental conditions encountered by military communications equipment. This report is a condensation of the three previous reports. It contains the results of the samples tested, the results of the dielectric material survey, and the recommended designs for the ten capacitors as requested in the contractual requirements.

Microwave Associates, Burlington, Mass.
ENGINEERING REFINEMENT PROGRAM FOR S BAND TR TUBE EST-25 ( ), by Emanual L. Horn. Quarterly progress rept. no. 3, 1 Oct-31 Dec 58, on Contract DA 36-039-sc-75039. [1958] 36p.
Order from LC mi$3.00, ph$6.30 PB 142 993

Continued measurements on spike leakage energy and interaction for a modified five element TR tube indicate that at 1.25 MW peak power, a minimum value of 0.1 erg for spike leakage energy is obtained with 0.2 db interaction. A high percentage of yield has ben obtained showing that this tube can be manufactured on a production basis. The initial design criteria for a 30% bandwidth duplexer has been established using a dual pre-TR and an auxiliary crystal protector TR tube. The initial design criteria for a dual pre-TR capable of operating over the 1B58A range has been established using a sidewall structure. The bandwidth obtained is 2600 to 3050 mc/s. The tube incorporates encapsulated input windows which are capable of operating at one megawatt peak power and two kilowatts average power. (See also PB 140 256)

Microwave Associates, Inc., Boston, Mass.
RESEARCH AND DEVELOPMENT OF IMPROVED KEEP-ALIVE ELECTRODES FOR TR TUBES. Final rept. for 15 Mar-31 Aug 56 on Contract DA 36-039-sc-42720. [1956] 90p. 6 refs. AD-112 606.
Order from LC mi$5.40, ph$15.30 PB 138 905

The prime factor leading to crystal deterioration is the rapid random fluctuations in electron density which are attributed to a wandering of the keep-alive discharge along the cone wall. TR tubes with the improved keep-alive structure have successfully operated at 200 kilowatts peak r.f. power in excess of 1000 hours without any apparent crystal deterioration. Keep-alive leads tested were metallic conductors or ceramic leads composed primarily of an oxide, but made conducting by the presence of a small percentage of metal. Tungsten, kovar, molybdenum, rhodium, stainless steel, L-cathode, synthor and partially reduced titania. Lead materials were studied under d.c. and r.f. conditions of operation.

Microwave Lab., Stanford U., Calif.
BASIC MICROWAVE RESEARCH. Scientific rept. no. 13 for 1 Jan-31 Mar 59 on Contract AF 19(604)1930. June 59, 13p. M. L. rept. no. 616; AFCRC-TN-59-366; AD-217 339.
Order from LC mi$2.40, ph$3.30 PB 143 205

Coupled cavity theory. Plasma physics studies. Nonlinear effects in ferrite media. (See also PB 142 203)

Microwave Lab., Stanford U., Calif.
THE INFLUENCE OF ELECTRON BEAM BEHAVIOR ON KLYSTRON EFFICIENCY, by José Thomaz Senise. Technical rept. on Contract N6onr-25123. Oct 58, 99p. 17 refs. M. L. rept. no. 552.
Order from LC mi$5.40, ph$15.30 PB 143 065

This investigation aims, through direct experiment, at a better understanding of the behavior of velocity-modulated electron beams, with emphasis on those factors which influence klystron efficiency. The conditions of operation are those which are usually not covered by any theory but which are typically encountered in high-power klystron amplifiers. The experiments were performed with an "rf beam analyzer" previously devised and used by D. K. Winslow at Stanford. The analyzer is essentially a pulse-operated, magnetically-focused, S-band two-cavity klystron amplifier, with shielded gun, designed on the basis of actual tube practice. The device differs from a conventional klystron in that it has a continuously variable drift length and a beam-scanning arrangement which permit complete cross sections of the beam to be obtained; these show both the dc and the rf radial current density distributions at any given drift distance.

Microwave Lab., Stanford U., Calif.
A STUDY OF THE GENERATION OF SUB-MILLIMETER RADIATION BY HIGH-ENERGY ELECTRONS IN WAVEGUIDE, by Robert N. Whitehurst. Technical rept. on Contract N6onr-25123. Jan 58, 99p. 20 refs. M. L. rept. no. 443.
Order from LC mi$5.40, ph$15.30 PB 139 324

A theoretical treatment of the radiation from a bunched high-energy electron beam in rectangular waveguide, with particular application to the "undulator" of Motz, is presented. The development of a linear accelerator for the production of the beam is described. Experimental results from the accelerator and from the undulator are given. The theory predicts a number of discrete frequencies for each waveguide mode. The wavelengths for a beam energy of 1.6 Mev are of the order of a few tenths of a millimeter. Wavelengths of a few millimeters to a tenth of a millimeter were measured. Some radiation, the origin of which is in doubt, was generated without the undulator magnetic field. A comparison of theoretical and experimental results is made.

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
DESIGN TECHNIQUES FOR TRANSISTOR ACTIVE CIRCUITS. Quarterly rept. no. 3, 1 Oct-31 Dec 57, on Contract AF 30(602)1648. 11 Jan 58, 13p. Rept. R-603.3-57; PIB-531; RADC-TN-58-135; AD-148 733.
Order from LC mi$2.40, ph$3.30 PB 138 888

In the past quarter, work has been continued on the design of a medium frequency high Q, band-pass filter. The basic idea here is to extend the Q much beyond that of the coil itself, by means of negative feedback around transistors. The ultimate purpose is to find the minimum sensitivities attainable and to directly relate drift tolerances on passive and active elements to drift tolerances in bandwidth and centre frequency.

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
THE EFFECT OF CLASSICAL EDDY CURRENTS ON THE OPERATION OF HALF-WAVE MAGNETIC AMPLIFIERS, by Kenneth T. Lian. Rept. on Contract Nonr-839(05). 11 Oct 57, 30p. 6 refs. Research rept. R-615-57; PIB-543; AD-149 179.
Order from LC mi$2.70, ph$4.80 PB 138 856

To determine a suitable model for the magnetic amplifier core, an analysis is presented of the steady state operation of a constrained half-wave magnetic aplifier in the presence of classical eddy currents. The core material is assumed to have a step-shape B-H characteristic, and the regions of opposite magnetization are assumed to be separated by planar walls of zero thickness which travel in a direction perpendicular to the lamination edge. The effect of such eddy currents on the transfer characteristic and waveshapes is determined. The solution for the field distribution in the lamination is presented.

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
EQUIVALENT CIRCUITS FOR SMALL SYMMETRICAL LONGITUDINAL APERTURES AND OBSTACLES, by A. A. Oliner. Rept. on Contract AF 19(604)2031. 4 Mar 59, 32p. 17 refs. Research rept. R-717-59; PIB-645; AFCRC TN-59-178; AD-214 841.
Order from LC mi$3.00, ph$6.30 PB 142 985

Formulas based on small aperture and small obstacle theory are presented for the determination of equivalent circuits for symmetrical longitudinal apertures and obstacles. These formulas are then applied to several examples of practical interest, including aperture discontinuities in trough waveguide and an obstacle array of interest to anisotropic radomes.

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
ON THE DISCONTINUITY PROBLEM AT THE INPUT TO AN ANISOTROPIC WAVEGUIDE, by A. D. Bresler. Rept. on Contract AF 19(604)2031. 20 Apr 59, 209p. 55 refs. Research rept. R-716-59; PIB-644; AFCRC TN-59-351; AD-216 236.
Order from LC mi$9.30, ph$31.80 PB 142 979

Variational solutions are obtained for the scattering coefficients at the junction of two dissipationless uniform waveguides one of which is anisotropic. These

solutions are then employed to obtain numerical results for the junction of two rectangular waveguides, one empty, the other filled with a transversely magnetized dissipationless ferrite. These numerical results are found to agree reasonably well with those obtained from an alternative solution to this problem given by Sharpe and Heim. A variational solution is then given for the scattering coefficients at the junction of an empty rectangular waveguide with one which is loaded with a transversely magnetized full height ferrite slab. This solution is found to be very slowly convergent except in that range in which the ferrite loaded waveguide propagates the surface wave mode alone.

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
OPTIMUM SYNTHESIS OF ACTIVE BAND-PASS FILTERS, by Herbert A. Mayer. Rept. on Contract AF 30(602)1648. 29 July 58, 62p. 6 refs. Research rept. R-674-58; PIB-602; RADC TN-58-390; AD-148 888.
Order from LC mi$3.90, ph$10.80 PB 139 155

The purpose of this investigation was to develop an optimum design technique for the synthesis of band-pass filters, by means of transistors, resistors and capacitors. The basic building block of the band-pass filter is the section with one pair of complex poles. An optimum design technique for the design of such a section has been developed.

Minneapolis-Honeywell Regulator Co. [Philadelphia, Pa].
DEVELOPMENT OF MINIATURE FACSIMILE SCANNING HEAD EMPLOYING TRANSISTORS, by K. H. Beck. Final rept. on Contract DA 36-039-sc-64525. 1 Oct 57, 59p. B. I. rept. no. 9109-6; AD-149 542.
Order from LC mi$3.60, ph$9.30 PB 142 807

A miniature facsimile scanning head was developed which employed transistors. An experimental model was completed of a belt-driven scanner utilizing 3 of these heads to scan flat or continuous copy. The basic scanning head employed in the drum and belt scanners uses a phototransistor and a switching transistor combined in a novel modulator circuit. Each scanning head also contains a miniature 2-stage transistor amplifier to raise the output signal to a suitable level for transmission through cables and commutators (required on the belt scanner) to the master amplifier unit where the signal is further amplified, filtered, and mixed with a suitable contrast adjusting signal. Extremely precise manufacturing and assembly techniques were employed in the fabrication of the belt scanner so that the required accuracy of scanning might be obtained. Attention was given to temperature stability and reliability of all of the circuits used. Characteristics of the scanning heads are satisfactory for most of the potential applications of the equipment.

Missouri U., Columbia.
ELECTROCHEMICAL SYSTEMS FOR USE IN LOW TEMPERATURE BATTERIES, by G. V. Lago, J. P. Karnes and others. Quarterly progress rept. no. 3, 17 Sep-16 Dec 58, Contract DA 36-039-sc-74994. [1958] 29p. 1 ref.
Order from LC mi$2.70, ph$4.80 PB 142 864

Freezing points and conductance measurements were continued for various concentrations in the CH_3CN-H_2O-KSCN, C_2H_5CN-H_2O-KSCN systems. New investigations were undertaken to determine the conductance and freezing points for a system using $NaClO_4$ in C_2H_5CN-H_2O. Load tests were made on a number of cells employing MnO_2-Shawinigan Black cathodes and either Mg or Zn anodes. Polarization of the Zn cell at -50°C has been compared with Zn and Mg cells at room temperatures. Determinations were made to find what components of the cell contributed most to internal resistance. (See also PB 138 837)

Motorola, Inc., Phoenix, Ariz.
TRANSISTOR CRYSTAL-CONTROLLED OSCILLATOR STUDY, by W. McSpadden and D. E. Reed. Quarterly progress rept. no. 1, 1 July-30 Sep 56, on Formulation of Design Procedures for Transistor Crystal-Controlled Oscillators, Contract DA 36-039-sc-72837. 15 Oct 56, 33p. 20 refs. Rept. P-2208-1.
Order from LC mi$3.00, ph$6.30 PB 139 058

Work under Phase I was begun in August. Since rather limited information is available in books and periodical literature, most of this material was covered by mid-September. Considerable additional information was obtained in September in the form of government contract reports. This material is still under study. Work under Phase II has just been started. One circuit has been under investigation at 100 kilocycles, 2 megacycles, and 9 megacycles. The Root Locus method of Evans is under investigation, and several other possible methods are being considered.

Motorola, Inc., Phoenix, Ariz.
TRANSISTOR CRYSTAL OSCILLATOR CIRCUITRY, by W. McSpadden, R. J. Shedko and W. J. Tobin. Quarterly progress rept. no. 2, 1 Oct-31 Dec 56, on Contract DA 36-039-sc-72837. 23 Jan 57, 81p. 9 refs. Rept. P-2208-2.
Order from LC mi$4.80, ph$13.80 PB 139 055

Except for the study of a publication or two which have appeared since the end of October, the work of Phase I is complete. Work under Phase II has concentrated in four areas: (1) The measurement of transistor parameters. (2) The measurement of quartz crystal resonator parameters. (3) The evaluation of circuits by standard tests. (4) The investigation of experimental circuits. Four basic circuits have been investigated. These include three using the series mode of the crystal and one using the parallel mode. Work in Phase III has concentrated on a simplified current feedback analysis and a negative resistance analysis. (See also PB 139 058)

Motorola, Inc., Phoenix, Ariz.
TRANSISTOR CRYSTAL OSCILLATOR CIRCUITRY, by W. McSpadden, R. J. Shedko, and W. T. Tobin. Quarterly progress rept. no. 3, 1 Jan-31 Mar 57, on Contract DA 36-039-sc-72837. 10 Apr 57, 60p. Rept. P-2208-3; AD-138 713.
Order from LC mi$3.60, ph$9.30 PB 139 056

Two analytical approaches to transistor crystal-oscillator design and 2 sets of tentative design data sheets for rapid oscillator design are presented. The first approach is based upon the power relationships in a feedback oscillator, and the second approach is based upon a negative resistance analysis for the Pierce oscillator. Partially completed design data sheets enable prediction of the critical circuit parameters, including the minimum load resistance, which assure oscillation. (See also PB 139 055)

National Bureau of Standards, Boulder, Colo.
PRECISE TIME SYNCHRONIZATION OF WIDELY SEPARATED CLOCKS, by Alvin H. Morgan. July 59, 65p. 8 refs. Technical note no. 22.
Order from OTS $1.50 PB 151 381

In many fields of science, such as in astronautics, missiles, astronomy, etc., which are being intensely investigated, the needs for new orders of magnitude of timing precisions have grown. For instance, the need has been greatly increased for more precise determination of the time of initiation and termination of the time of initiation and termination of certain events, which may occur several hundred miles apart. Or, in the location of bodies in space flight, the precise determination of their transit time at known sites is of major importance. This paper describes known precise methods of setting a group of widely separated clocks to precisely the same time and keeping them in close agreement indefinitely; most of the proposed methods are now available. An estimate of the accuracies of each method are given. Also, there is some discussion of high frequency radio propagation theory pertinent to two of the methods and a few sets of measurements of the propagation delay time of high frequency signals from WWV to WWVH are given. Several graphs and tables are included to simplify some of the calculations.

National Research Council of Canada.
BIBLIOGRAPHY ON THE HELICAL BEAM ANTENNA, by J. Y. Wong and R. S. Thomas. May 59, 23p. 66 refs. ERA-344; NRC no. 5264.
Order from LC mi$2.70, ph$4.80 PB 142 876

This report contains 66 abstracts of papers and reports on the helical beam antenna. The purpose is to provide a ready source of information to workers in this field.

Naval Ordnance Lab., White Oak, Md.
A NATURAL APPROACH TO THE CALCULATION OF SYSTEMS RELIABILITY, by H. E. Lacey and D. W. Sencenbaugh. 31 Oct 57, 43p. 3 refs. NAVORD rept. 5660.
Order from LC mi$3.30, ph$7.80 PB 139 323

A method is developed to permit the calculation of systems reliability via the natural approach of Boolean algebra directly to certain formulae from the theory of probability. Sample calculations are then made for the failure and premature probability of simple systems.

Naval Research Lab., Washington, D. C.
THERMOELECTRICITY ABSTRACTS. Aug 59, 81p. 1021 refs.
Order from OTS $2.25 PB 151 810

This, the second bibliography in a series, represents the accumulation or unclassified references resulting from a search of abstract journals, indexes and bibliographies immediately accessible, since the issuance of the first listing, dated May 1959. Some early as well as current material is included. Additional bibliographies will be issued at intervals, the objective being to attain as complete coverage of the literature as possible. Arrangement for periodical entries is alphabetical - by author, or by title if author is lacking; and for research reports - by issuing agency. Each entry is numbered in preparation for an anticipated index. Abbreviations for journal titles are based on those used by the U. S. Naval Research Laboratory Library. A list of these abbreviations together with the journals which they represent appears on the pages following this introduction. The majority of the journals and books referred to should be available for consultation or borrowing at the larger public or research libraries. Research reports can usually be obtained through established procedures from the Armed Services Technical Information Agency and the Office of Technical Services. AD and PB numbers are included when know. (See also PB 151 657)

Navy Electronics Lab., San Diego, Calif.
SLOTTED TRIANGULAR WAVE-GUIDE ANTENNA, by N. Kashiwabara. 30 Oct 58, 12p. 7 refs. Research and Development rept. 870.
Order from LC mi$2.40, ph$3.30 PB 139 265

The use of a triangular wave guide in a traveling-wave slotted wave-guide antenna has been investigated and appears to be feasible. An eight-shunt-slot traveling wave antenna to operate at 1060 megacycles per second was built and tested. Performance was substantially in accord with theory. The triangular wave guide offers ease of fabrication and greater structural strength, compared to conventional structures.

New York U. Coll. of Engineering, N. Y.
EVALUATION AND OPTIMIZATION OF DIGITAL COMMUNICATION SYSTEMS, by J. J. Metzner and K. C. Morgan. Scientific rept. no. 5, 15 Jan-15 Nov 58, on Contract AF 19(604)1964. [1958] 65p. 14 refs. AFCRC-TN-58-578; AD-206 576.
Order from LC mi$3.90, ph$10.80 PB 138 737

The problem of transmission of information over a bi-directional communication system with noise in the forward and feedback channels is discussed. A system which prevents nonconservation of message length is described and the results of analysis are summarized. (See also PB 138 488)

New York U. Coll. of Engineering, N. Y.
INVESTIGATION, STUDIES, AND EVALUATION OF PERFORMANCE OF CRYSTAL UNIT CHARACTERISTICS. TASK A. INVESTIGATION AND STUDIES OF MICROWAVE FREQUENCY DIVISION, by David Cohen. Quarterly progress rept. no. 8 (Final) for

15 June-15 Sep 53 on Contract DA 36-039-sc-5493. [1953] 63p.
Order from LC mi$3.90, ph$10.80 PB 143 129

A summary of theories for microwave frequency division with equipment and circuitry developed for their verification. The locked oscillator divider using a series crystal diode mixer is analyzed for 2 to 1 and 3 to 1 division. A "Heterodyne Amplifier" for 900 mc. is presented with an analysis for use of the heterodyne system for frequency division. Designs of tunable resonant cavities as narrow band filters for use in the heterodyne system are presented with comparisons to fabricated models. A breadboard model of a heterodyne divider was constructed to divide 880 mc. to 220 mc. The intermediate frequency was chosen at 80 mc. and a modified regenerative divider was used to divide the 80 mc. to 20 mc. (See also PB 140 447)

Office of Scientific Research and Development. Div. 17.
EVALUATION OF HEARING AIDS (RELEVANT TO SERVICE CONTROL NO. AN-10) by Leo L. Beranek (Electro-Acoustic Lab) and S. S. Stevens (Psycho-Acoustic Lab) Rept. on Contract OEMsr-658. 1 May 45, declassified. 426p. 12 refs. MHR-88; OSRD rept. no. 4666; ATI-163 782.
Order from LC mi$11.10, ph$65.10 PB 143 405

A peaked response characteristic is common to all hearing aids tested to date, the main peak usually arising from the earphone characteristic. This primary peak ordinarily falls in the region from 1000 cps to 2500 cps. Many hearing aids use the Brush Type DJ or DK crystal earphones, which have peaks at 1300 cps and 1800 cps respectively. Secondary peaks may arise from the earphone and microphone characteristics. In most cases, the relative amplification at low frequencies is very small, becoming practically negligible at 200 cps. Measurements of the amplifier characteristics of the hearing aids show that the electrical response is in general smooth and free from peaks, and that usually each instrument has one tone control setting which gives a reasonably flat amplifier response. In some cases the tone controls are relatively ineffective, acting mainly to change the gain of the instrument. For any given conditions of input sound level and volume control setting, distortion generally decreases with increasing frequency of input signal. The overload points on the output vs. input graphs are not, therefore, points of equivalent distortion at the various frequencies. In many hearing aids a limiting action takes place for high signal levels at frequencies above 1000 cps, approximately, due apparently to grid rectification. The action is such that the output is limited, but the distortion is very much less severe than at low frequencies for equal input sound levels. In some of the graphs of distortion vs. output level of the hearing aid, particularly for an input sound pressure level of 90 db, it will be noted that there are two values of distortion for a given output level. This is because, as the volume control is advanced continuously, the percentage distortion increases, but the output sound pressure level as measured may reach a maximum and then go down. Measurements were made of the variation in impedance of a few crystal earphones with variation in temperature. Typical results of such tests are shown in Fig. 24, for a Brush Type DK earphone. The data are plotted to show the ratio of the absolute value of the impedance at room temperature (22°C). Measurements were made at six frequencies, ranging from 200 to 5000 cps, and the same results were obtained for each frequency.

Ohio State U. Research Foundation, Columbus.
STUDIES ON THE BARKHAUSEN-KURZ OSCILLATOR AT CENTIMETER AND MILLIMETER WAVELENGTHS, by F. S. Chen and D. T. Davis. Technical note no. 4 on Contract AF 18(600)982. Aug 58, 61p. 6 refs. AFOSR TN-58-826; AD-202 911.
Order from LC mi$3.90, ph$10.80 PB 142 897

An oscillator employing a magnetically focused electron stream traveling in an electric field resulting from a parabolic potential distribution can be operated as a Barkhausen-Kurz oscillator. Electrons traveling in such a potential distribution execute simple harmonic motion, and insofar as an accurate parabolic potential distribution is achieved the oscillation frequency of the electrons will be independent of their amplitude. If the interaction gap of a cavity resonator is located at the center of such a potential distribution and the resonator is tuned to an odd integral multiple of the frequency of simple harmonic electron motion, the electrons can then remain in proper phase to deliver energy to the high-frequency field of the resonator on successive transits. The present investigation discusses the effects of multiple transits on the characteristics of the oscillator. The conclusions are well correlated by experiment.

Ohio State U. Research Foundation, Columbus.
STUDY OF PARAMETRIC AMPLIFICATION, by G. C. Gerhard. Scientific rept. no. 2 on Contract AF 19(604)4060. June 59, 20p. 1 ref. AFCRC-TN-59-550.
Order from LC mi$2.40, ph$3.30 PB 143 192

The performance of varactor amplifiers may be enhanced for some purposes by using diodes with special nonlinear characteristics. By approximating a step in the impurity density distribution, a junction diode with an abrupt change in slope in its capacitance-reverse bias characteristic may be fabricated. This change in slope enables a parametric amplifier employing such diodes to exhibit great sensitivity at that operating point while maintaining stability. Design criteria for such a diode are reviewed; design theory is presented. Fabrication techniques and problems are discussed. The results of preliminary measurements on an experimental unit are presented. (See also PB 140 143)

Pacific Semiconductors, Inc., Culver City, Calif.
INTRINSIC-BARRIER TRANSISTOR TECHNIQUES, by J. L. Buie, M. A. Clark and others. Final technical rept. for 1 Apr 56-31 Mar 57 on Contract DA 36-039-sc-70144. [1957] 119p. 14 refs. PSI-3000:2-11-F; AD-132 206.
Order from LC mi$6.00, ph$18.30 PB 138 663

A discussion is presented on the development of intrinsic-barrier transistor techniques with emphasis on methods for making coaxial transistors. A special study is made of methods for the diffusion of base layers on intrinsic Ge, and new methods are developed which employ vapor-phase transport and gettering of

impurities. These methods make possible the diffusion of doner elements into very high resistivity Ge with little or no thermal conversion of the bulk material; they also preserve the minority-carrier lifetime of the Ge to a high degree. A base-contact method is described in the broad sense which includes collector alloying, emitter evaporation and alloying, and base-contact alloying. The preparation of the material is discussed and includes orientation, polishing and etching of the Ge. The final assembly and encapsulation of the transistors is explained, with a careful study of the factors affecting the frequency performance. A complete flow-chart is given for the process which incorporates built-in control experiments and tests to make the over-all process reproducible. The over-all program comprised a study of the diffusion, collector, emitter and base-processing types of techniques, on the basis of which efficient transistors can be fabricated.

Pacific Semiconductors, Inc., Culver City, Calif.
VARIABLE CAPACITOR DIODES, by L. S. Chase and H. D. Frazier. Quarterly progress rept. no. 2, 1 July-30 Sep 58, on Contract DA 36-039-sc-75044. [1958] 93p. 15 refs.
Order from LC mi$5.40, ph$15.30 PB 142 871

The design theory for the electronic tuning type variable capacitance diode is presented in detail. The structure of this unit is p+n+n n+ fabricated by consecutive diffusions. Tentative processes are proposed. Voltage sensitivity of V^{-1} is reported from an experimental device having an n+p+p p+ structure. The current understanding of AFC and FM modulator device targets is outlined. Experimental characteristics of devices fabricated in both the high and low capacitance range are presented and discussed. Areas of further investigations in the low capacitance range are discussed and the approaches are outlined. Four instrument systems are necessary to make reliable measurements over the capacitance and figure of merit range of this contract. Maximum Q measurement accuracy of each system is defined and discussed along with a possibility of further extension of this accuracy for low capacitance diodes. (See also PB 140 253)

Parke Mathematical Labs., Inc., Carlisle, Mass.
OCCUPANCY THEORY WITH APPLICATION TO MULTI-CHANNEL COMMUNICATION SYSTEMS, A CORRECTION, by John A. Riley. Scientific rept. no. 2 on Contract AF 19(604)3471. June 59, 19p. 4 refs. AFCRC TN-59-371; AD-217 817.
Order from LC mi$2.40, ph$3.30 PB 142 907

Philco Corp., Philadelphia.
RESEARCH AND EXPERIMENTAL WORK ON MICROWAVE TRANSISTORS, by R. L. Goldman, T. V. Sikina and others. Quarterly progress rept. no. 4, 15 Oct 58-15 Jan 59, on Theoretical and Experimental Investigation of New Semiconductor Devices for Operatior in the 2 to 10 Kilomegacycle Range, Contract DA 36-039-sc-74988. [1959] 23p. Philco no. H-2153-4.
Order from LC mi$2.70, ph$4.80 PB 142 770

The work during this period on the depletion layer transistor (DLT) was concerned mainly with circuit innovations in the AC gain measurement apparatus, low-frequency (small signal) gain measurements, and the fabrication study of devices sealed in JETEC-30 packages. Effort was also directed toward the study of power-gain variation. Innovations in the circuit design made it possible to make very reliable low-frequency measurements (small-signal). These measurements in turn made a program of device fabrication feasible. The method of operation by which power gain was achieved requires further exploration. The successful fabrication of DLT's requires a very high degree of control. A description of the present procedure of fabrication of the DLT in a hermetically sealed package is included in the report. This procedure has been successful so far in the production of devices having measurable power gain. Power-gain variation is illustrated in a table giving the parameter changes of one unit.

Physical Research Labs., Boston U., Mass.
STUDY OF APPLICATION OF COMMUNICATION THEORY TO RADAR ANTENNA SCANNING, by Edward L. O'Neill. Final rept. for 1 Feb 56-31 July 58 on Contract AF 19(604)1735. [1959] 62p. 17 refs. AFCRC TR-58-352; AD-206 905.
Order from LC mi$3.90, ph$10.80 PB 142 895

Early in the study it is shown that the informational capacity of a radar scanning system depends on the coherence (in the spatial sense) of the received radiation. Future progress along these lines cannot be made until the coherence properties of the received waveform are known. A symposium dealing with Communication Theory and Antenna Design held in January, 1957, did not unambiguously resolve this question. Attention is then given to the tolerances applied to the various wave front errors (aberrations) in the design of antennas. It is found in antenna design that the tolerance conditions are frequently imposed on each of the wave front errors separately. However, it seems reasonable to impose tolerance conditions on the root mean square value of the wave front deformation instead. Relations between r.m.s. wave front error and loss in gain in db units are derived. An expression for the surface over which the r.m.s. wave front error is a minimum or the power gain ratio a maximum is derived. Wave front errors up to the third order in aperture coordinates are considered, resulting in an expression that is only approximate for large field angles and small focal length over diameter ratios. Fifth order corrections extend the results to larger field angles and even smaller focal ratios. The possibilities of using the Zernike polynomials for optimum aberration balancing are discussed and shown to be useful for mathematical sophistication but not for ease in computation. The information capacity of any imaging system in the electromagnetic spectrum is derived using the Sampling Theorem. An example utilizing a flat signal-to-noise ratio and Gaussian response function is calculated and plotted.

Polytechnic Research and Development Co., Inc., Brooklyn, N. Y.
EXTREMELY BROAD BAND COMPONENT

DEVELOPMENT, by Samuel Hopfer. Final rept. for 1 Apr 53-30 June 54 on Contract DA 36-039-sc-42662. Aug 54, 80p. 2 refs. Rept. no. 9.01; AD-48 465.
Order from LC mi$4.50, ph$12.30 PB 143 102

Results are summarized of the development of ridged guide components in the 3.75- to 15-kmc range. The first objective was concerned with obtaining complete design information on the transmission line properties of the single ridged guide system, and the second objective was concerned with the building of a number of ridged guide components. General design information of single and double ridged guides is presented in graphical form and allows the determination of all the electrical properties of ridged guide transmission lines. The following components are discussed: ridged to rectangular guide adapters, coax to ridged guide adapter, H-bend, termination, crystal mount, tuner, variable attenuator, and slotted section. Performance of these components is in some respects below that of the conventional narrow-band devices. With additional engineering effort, these components are expected to be comparable in performance with the conventional items.

Princeton U., N. J.
SOME EXPERIMENTAL STUDIES OF SIGNAL DETECTION IN NONSTATIONARY BACKGROUND NOISE, by T. R. Williams. Final rept. on Acoustic Signal Processing, Contract N6onr-270, T.O.5. Mar 58, 26p. 23 refs.
Order from LC mi$2.70, ph$4.80 PB 139 370

The results of an experimental investigation of the effects of non-stationary noise on detector performance are given. The specific detection problem investigated was that of determining the presence or absence of a noise-like signal, given the output of two receivers each of which contained a nonstationary noise and the signal, if it was present. The noises were both members of a nonstationary ensemble and were obtained by modulating Gaussian, stationary noises having band-pass spectra with a low-frequency random waveform obtained by strongly clipping a Gaussian, stationary, low-frequency noise with a band-pass spectrum. The signal and the unmodulated noises had spectra of the same form and were statistically independent. A multiplier followed by an RC averager was used as a detector, and the threshold signal power was estimated from a series of detection trials.

Purdue U. Engineering Experiment Station, Lafayette, Ind.
HIGH POWER IMPULSE NOISE SOURCES, by R. H. George and H. J. Heim. Final rept. on Contract AF 30(602)1405. 30 June 57, 25p. [RADC-TR-57-170; AD-131 330].
Order from LC mi$2.70, ph$4.80 PB 139 344

This final report presents brief summaries and lists of conclusions and recommendations for two scientific reports on High Power Impulse Noise Sources. One covers "sources" for the frequency ranges of 200 to 1000 and 3000 to 5000 megacycles. The second describes a high pulse rate "source" which produces 15,000,000 pulses per second with random distribution in time.

Raytheon Mfg. Co., Bedford, Mass.
IMPROVEMENT OF MAGNETOSTRICTION-ROD FILTERS SINGLE-CRYSTAL FILTERS. Interim technical rept. no. 4 on Contract AF 30(635)2902. Feb 57, 15p. 18 refs. BR-151; RADC TN-57-216; AD-131 114.
Order from LC mi$2.40, ph$3.30 PB 138 886

Methods were studied for producing single crystals which are suitable for use in magnetostriction filters. A few single crystals were tested to evaluate characteristics such as insertion loss and bandwidth when the crystals are used as filter resonant elements. Results indicated that the filter insertion loss will be satisfactory if magnetic crystals are used. Coupling through an applied layer of magnetic material is satisfactory only for experimental work. A suitable magnetic alloy such as 44% Ni-Fe would give good magnetostrictive coupling. The Q of a properly prepared single-crystal filter is much higher than that of the polycrystalline counterpart with the same composition; the limiting value of Q for a magnetic alloy is apparently about 30,000. The stability of experimental filters could probably be improved if the crystals were mounted by a more elaborate technique and if a large quantity of a single type of crystal were available for tests. The original need for the single-crystal filters was partially eliminated by the ability to reproduce accurately center frequencies in a given group of polycrystalline filters. A literature survey was made of the following subjects: the domain structure of magnetic materials, the nature of crystal and elastic anisotropy, the origins and behavior of magnetostriction, elastic damping in metals, and the origin of high coercive force in permament magnets. (See also PB 135 358)

Research Lab. of Physical Electronics, Tufts [U]. Medford, Mass.
AN INVESTIGATION OF THE CHARACTERISTICS OF ELECTROMECHANICAL FILTERS. Quarterly rept. no. 1 on Contract DA 36-039-sc-5402. 1 Feb 51, 22p. 6 refs.
Order from LC mi$2.70, ph$4.80 PB 139 084

The general problem in the present study deals with the design and development of electromechanical band-pass filters in the frequency range from one to twenty megacycles per second.

Research Lab. of Physical Electronics, Tufts [U]. Medford, Mass.
AN INVESTIGATION OF THE CHARACTERISTICS OF ELECTROMECHANICAL FILTERS, by C. R. Mingins, S. Bartnoff and others. Quarterly rept. no. 2 on Contract DA 36-039-sc-5402. 1 May 51, 40p. 1 ref.
Order from LC mi$3.00, ph$6.30 PB 139 092

An investigation is being carried on in the design techniques applicable to band-pass filters having center frequencies in the frequency range from 1 megacycle/sec to 20 megacycles/sec. The requirements are set forth and the measures already taken as well as those proposed to endeavor to meet these require-

ments are discussed. Experimental results are described which make use of a single crystal converted into a two-transducer unit by means of divided plating, the coupling being controlled to some extent by cutting away or otherwise changing portions of the unplated section. Experiments on laminar types of filter are also reported. The theoretical analysis of an electromechanical filter is extended, and an attempt is begun to express the ratio of output and input voltages in terms of the electrical and mechanical parameters of the filter structure. (See also PB 139 084)

Research Lab. of Physical Electronics, Tufts [U.] Medford, Mass.
AN INVESTIGATION OF THE CHARACTERISTICS OF ELECTROMECHANICAL FILTERS, by C. R. Mingins, A. D. Frost and others. Quarterly rept. no. 3 on Contract DA 36-039-sc-5402. 1 Aug 51, 56p. 2 refs.
Order from LC mi$3.60, ph$9.30 PB 139 085

The investigation of design techniques applicable to band-pass filters having center frequencies is the range from 1 megacycle/sec to 20 megacycles/sec is continued. Methods are demonstrated for use with single-crystal filters to increase the band width or to decrease it, to obtain a more uniform transmission over the pass band, and to make the cutoff edges sharper. Experiments with different cements and methods of bonding the components in a non-homogeneous laminar filter are reported. Techniques used in making homogeneous laminar filters are described and the results of preliminary tests are shown. (See also PB 139 092)

Rome Air Development Center, Griffiss AFB, N. Y.
AUTOMATIC MONITORING AND DATA PROCESSING SYSTEM (AMDPS) FOR GROUND-BASED RADARS, by Jack Maglaya and Hollis J. Hewitt. Dec 58, 43p. 3 refs. RADC TR-58-135; AD-148 932.
Order from LC mi$3.30, ph$7.80 PB 139 159

This report describes an automatic monitoring and data processing system (the AMDPS) which semiautomatically records operator controlled radar target data and automatically records radar performance data. The system may be utilized with any ground-based radar or electronic countermeasures equipment employed in the course of aircraft flight tests. The paper-taped radar target data is usable with digital computer Elecom 120 or Datatron 205 so as to aid in solving a variety of electronic countermeasures problems at the ECM Test Facility of Rome Air Development Center. In addition to functioning as a confidence check on recorded target data, the system provides a permanent record of radar performance for subsequent use by maintenance personnel.

Rome Air Development Center, Griffiss AFB, N. Y.
DESIGN OF A RADAR PERFORMANCE MONITOR FOR RADAR SET AN/FPS-8, by Richard Moore. Dec 58, 31p. 4 refs. RADC TR-58-112; AD-148 869.
Order from LC mi$3.00, ph$6.30 PB 139 158

This report describes the radar performance monitor designed for use with Radar Set AN/FPS-8. The monitor was developed by the Sperry Gyroscope Company under a Rome Air Development Center contract. The monitor provides a continuous check on AN/FPS-8 transmitter power, receiver sensitivity (noise figure), and relative tuning. A simple and convenient switching arrangement permits the antenna voltage standing wave ratio to be readily checked. The monitor posesses other outstanding features: Application to many other ground radar sets, miniaturization, fail-safe operation, and operation without interference with radar set operation. New and improved design techniques, in the form of a peak r-f power meter, a noise injection and noise measuring circuit, and microwave components were utilized. The use of printed-board plug-in circuits with miniaturized components helped in reducing the over-all size.

Rome Air Development Center, Griffiss AFB, N. Y.
DESIGN OF A TACTICAL TELEPHONE CENTRAL OFFICE GROUP MANUAL, AN/GTA-8, by J. A. Thompsen and F. Kozien. July 58, 45p. RADC TR-58-85; AD-148 780.
Order from LC mi$3.30, ph$7.80 PB 138 874

Design and development work required to produce Tactical Telephone Central Office Group Manual, AN/GTA-8 is described. Work was performed by Connecticut Telephone and Electric Corporation according to RADC specifications. A searching analysis and study of existing telephone group equipments and systems was carried out in order to secure equipment offering improved circuit performance, reduced power requirements, reduced size and weight, and which permitted flexibility of facilities. All of these major objectives were achieved with the result that a telephone group was developed which is more advanced than previously satisfactory telephone systems.

Rome Air Development Center, Griffiss AFB, N. Y.
EXTENDING ELECTRON-TUBE LIFE WITH TUBE SHIELDS, by Anthony Coppola. July 58, 32p. 10 refs. RADC-TR-58-64; AD-148 716.
Order from LC mi$3.00, ph$6.30 PB 138 986

Personnel of RADC have for some time been engaged in the study of the quantitative effects of heat on, and optimum techniques for removing heat from, electronic equipment. This report is concerned with that portion of the study which involves the removal of heat from electron tubes by means of appropriate tube shields.

Rome Air Development Center, Griffiss AFB, N. Y.
RADC EVALUATION OF AIRPORT SURFACE DETECTION EQUIPMENT, RADAR SET AN/FPN-31, by Frank T. Benvenga. Dec 57, 28p. RADC-TR-57-136; AD-131 224.
Order from LC mi$2.70, ph$4.80 PB 138 997

This report describes the evaluation of Radar Set AN/FPN-31 conducted at Griffiss Air Force Base by the Rome Air Development Center. The AN/FPN-31 constitutes an airport surface detection equipment built by private contractor to RADC specifications. The evaluation tests showed the AN/FPN-31, when used by properly trained personnel, to be capable of all types of airport surface movement control. The equipment's

performance during foul-weather conditions is excellent.

Rome Air Development Center, Griffiss AFB, N. Y.
TRANSIT CASES FOR GROUND ELECTRONIC EQUIPMENT IN LOGISTIC SUPPORT, by Richard C. White. July 58, 50 p. 2 refs. RADC-TR-58-80; AD-148 766.
Order from LC mi$3.30, ph$7.80 PB 138 875

This report describes engineering advances made in transit cases in order to familiarize Air Force engineers and contractors with the design, fabrication, and approaches to problems associated with transit cases for USAF usage. The program consisted mainly of the development and testing of case materials and design techniques. Aluminum and reinforced Fiberglas were found to have the high strength and corrosion resistance required to withstand severe mechanical and climatic conditions to which transit cases are subjected. The design techniques included shock and vibration mounting, waterproof sealing, and hardware fabrication. The various types of transit cases were thoroughly tested under simulated field conditions of rough handling and severe climate to evaluate the case materials and designs.

Seattle U., Wash.
CONTINUOUSLY EXCITED TRAVELING WAVE ANTENNAS, by Attilio J. Giarola. Scientific rept. no. 1 on Contract AF 19(604)4052. June 59, 51p. 9 refs. AFCRC-TN-59-369; AD-217 819.
Order from LC mi$3.60, ph$9.30 PB 143 204

An amplitude modulation of the surface wave guided by a traveling wave antenna can be obtained by means of continuous excitation of the antenna over its entire length. This principle has been applied to long Yagi antennas by coupling them to parallel two wire transmission lines. The amplitude modulation of the surface wave is observed to be very nearly sinusoidal, and the distance between successive maxima may be in the order of many wavelengths. The cycle of modulation can be controlled by the coupling parameters. Experimental results are presented on end-fire radiation obtained from continuously excited 40 wavelength Yagi antennas.

Snell, Foster D., Inc., New York.
THEORY OF ELECTROCHEMICAL CELL REACTIONS. VOLUME 6. PART 3. ELECTROCHEMICAL CELLS WITH ALKALINE ELECTROLYTES, by Philip A. P. Crispino, Lloyd Osipow, and Harry P. Gregor (Polytechnic Inst. of Broolkyn). Rept. on Contract DA 36-039-sc-73137. 30 Apr 58, 106p. 51 refs.
Order from OTS $2.50 PB 161 015

This volume is the sixth in a series studying the application of modern electrochemical theory to cells and batteries. It is the purpose of this work to place in the hands of those engaged in or interested in the development of batteries, a compilation of modern chemical and electrochemical theory selected from the point of view of the battery researcher, together with such information as is currently available on the theoretical aspects of the various systems which are in use, or which show promise of becoming important, either commerically or in specialized applications for our national defense.

South Carolina U., Columbia.
APPLICATIONS OF DIELECTRIC PRISMS AT MILLIMETER WAVE LENGTHS, by R. G. Fellers. Rept. on Contract AF 18(603)43. 16 July 59, 21p. 12 refs. AFOSR TN-59-687.
Order from LC mi$2.70, ph$4.80 PB 142 973

This paper describes the use of a pair of dielectric prisms as an adjustable bidirectional coupler and as a cut-off attenuator capable of theoretical calibration. Such devices may be used as a part of a free-space transmission system intended to replace waveguide for transmission of energy over within-system distances. It is expected that transmission of this type will find its maximum usefulness in the millimeter wavelength range. Much of the work on the prism arrangement, and its applications, is attributable to Dr. A. W. Lines and his associates working at the Telecommunications Research Establishment in England. This paper includes a description of some of their work as well as some additional data and development.

South Carolina U. [Columbia].
A CIRCULAR POLARIZATION DUPLEXER FOR MILLIMETER WAVES, by R. G. Fellers. Rept. on Contract AF 18(603)43. 1 Nov 58, 13p. 9 refs. AFOSR-TN-58-771; AD-201 774.
Order from LC mi$2.40, ph$3.30 PB 138 740

This paper describes a circular-polarization duplexer for use in the millimeter wavelength range. Such a duplexer finds its field of application in any system which utilizes the same antenna for simultaneous transmission and reception, as for example, a continuous-wave radar. The millimeter wavelengths are here defined as covering the range from 1 to 10 millimeters (frequency range 30,000 megacycles to 300,000 megacycles.)

Sprague Electric Co., North Adams, Mass.
IMPROVEMENT OF POLARIZED ALUMINUM ELECTROLYTIC CAPACITORS. Final rept. for 1 Mar 56-31 May 58 on Contract DA 36-039-sc-71186. [1958] 106p.
Order from LC mi$5.70, ph$16.80 PB 142 859

Thirteen electrolytes in the 450V range and six in the 25V range were evaluated so that the best could be selected for use in capacitors to be submitted to USASEL. As a result of this evaluation, electrolyte EL-44-90 was chosen for use in 450V units and EL-41-90 for use in 25V units. The choice was based on the fact that capacitors containing these mixtures exhibited the desirable features of good capacitance stability and low impedance at -55°C, good shelf life characteristics, low leakage and small changes after surge testing.

Stanford Electronics Labs., Stanford U., Calif.
COUPLING NETWORK DESIGN USING DISCRETE-FREQUENCY DATA, by P. A. Ligomenides. Technical rept. no. 45 on Contract Nonr-225(24). 22 Oct 58, 195p. 12 refs.
Order from LC mi$8.70, ph$30.30 PB 143 066

The problem of broad-band coupling-network design is one of primary practical importance in electrical engineering. This report is concerned with the derivation of a method for such network design. The design problem may be stated as follows: "To design a two-port coupling network that presents some prescribed input impedance, Z_{in}, when terminated in a prescribed load impedance, Z_L, both input and load impedances being described over a certain band of frequencies." A method for the design of practical lossless ladder networks, based on a point-by-point matching in the frequency domain, is described.

Stanford Electronics Lab., Stanford U., Calif.
SOME LOGARITHMIC VIDEO AMPLIFIER ANALYSIS AND DESIGN TECHNIQUES, by J. C. de Broekert. Rept. on Contract DA 36-039-sc-63189. 5 Apr 57, 62p. 8 refs. Technical rept. no. 152-1; AD-127 278.
Order from LC mi$3.90, ph$10.80 PB 138 956

Logarithmic-amplifier design techniques are well known for bandpass type amplifiers. Most of these techniques are applicable to video amplifiers through a low-pass analogue. A general analysis of logarithmic-amplifier design techniques applicable to both bandpass and lowpass amplifiers will be presented here together with design examples of two basic design realizations.

Stanford Electronics Labs., Stanford U., Calif.
A TRAVELING-WAVE TUBE USING COUPLED COAXIAL CAVITIES, by B. Arfin. Rept. on Contract DA 36-039-sc-63189. 30 Oct 56, 98p. 13 refs. Technical rept. no. 220-1; AD-111 960.
Order from LC mi$5.40, ph$15.30 PB 138 904

This report describes a study directed toward obtaining a traveling-wave tube capable of power outputs wel beyond the range of helix structures. A modified interdigital structure, first suggested by M. Hines of Bell Telephone Laboratories, operating in a space-harmonic region was investigated. The advantages of this structure as compared to a conventional interdigital circuit are shown.

Stanford Research Inst., Menlo Park, Calif.
DESIGN DATA FOR ANTENNA-MULTICOUPLER SYSTEMS, by S. B. Cohn, J. F. Cline and others. Scientific rept. 1, 15 May-14 Aug 57, on Contract AF 19(604)2247. Aug 57, 39p. 15 refs. AFCRC-TN-57-762; AD-133 700.
Order from LC mi$3.00, ph$6.30 PB 138 729

This report is divided into three parts. The first part discusses multicoupler connections, both the external connections, i.e., connections between the multicoupler and the various receivers, transmitters, and antennas, and also the internal connections between the various filters and other elements of which the multicoupler is composed. The second part of the report discusses the design of narrow-band, symmetrical filters. The third part of the report discusses the design of a three-port antenna-multicoupler complex that utilizes strip-line directional couplers and phase shifters, together with a biconical horn antenna.

Stanford Research Inst., Menlo Park, Calif.
DESIGN DATA FOR ANTENNA-MULTICOUPLER SYSTEMS, by J. F. Cline and B. M. Schiffman. Scientific rept. 2, 15 Aug-14 Nov 57, on Contract AF 19(604)2247. Nov 57, 32p. 2 refs. AFCRC-TN-57-951; AD-133 762.
Order from LC mi$3.00, ph$6.30 PB 138 730

The input immittance, frequency response, and parallel connection limitations of bandpass filters are treated. The filters are 2- and 3-resonator symmetrical, narrow-band filters with equal terminal loadings and equal values of unloaded resonator Q; these are adjusted to produce minimum band-center loss for a given adjacent-channel attenuation. (See also PB 138 729)

Stanford Research Inst., Menlo Park, Calif.
DESIGN DATA FOR ANTENNA-MULTICOUPLER SYSTEMS, by J. F. Cline and P. M. Sherk. Scientific rept. 4, 15 Feb-14 May 58, on Contract AF 19(604)2247. May 58, 27p. 3 refs. AFCRC-TN-58-193; AD-152,450.
Order from LC mi$2.70, ph$4.80 PB 138 731

This is the fourth in a series of reports on the design of antenna-multicoupler systems for use where several transmitters and receivers are operated simultaneously with a single antenna system. The filter-design formulas given in the third report in the series are used in the present report to show the choices of the coupling capacitances, resonator parameters, and tuning methods in the narrow-band filters affect the extra-channel susceptance of the filters, which in turn affect the permissible number of channels for a given degree of mismatch. The present report also discusses the factors affecting the degree of isolation obtainable between the ports of the three-port stripline multiplexing antenna described in the first report in this series. (See also PB 138 730)

Stanford Research Inst., Menlo Park, Calif.
A FLUSH-MOUNTED LEAKY-WAVE ANTENNA WITH PREDICTABLE PATTERNS, by Richard C. Honey. Scientific rept. no. 4 on Contract AF 19(604)1571. June 58, 65p. 11 refs. AFCRC TN-57-754; AD-133 660.
Order from LC mi$3.90, ph$10.80 PB 138 873

This report describes the design and the measured performance of a large, flat antenna consisting of an inductive sheet spaced over a conducting surface. The analysis, described in a previous report, employs the transverse-resonance method to determine the radiating properties of the structure. This analytical technique is shown to predict very accurately the amplitude and phase of the illumination along the aperture of the antenna.

Sterling Precision Corp., Flushing, N. Y.
ANTENNA AS-810 ( )/GPR, by M. Lombardi and E. Bergman. Final technical rept. for 1 June 55-28 Feb 57 on Tracking Antenna for Guided Missile Instrumentation, Contract DA 36-039-sc-64678. 21 Feb 57, 104p. Rept. no. 400-1; AD-128 525.
Order from LC mi$5.70, ph$16.80 PB 139 345

Development was completed on a high-gain, broadband tracking antenna for monitoring signals from missiles and other targets in flight. The electrical requirements of the antenna are that it operate over the 940- to 12,100-mc range; have a narrow beam (between 3° and 12°) in both azimuth and elevation in conjunction with low side lobes (greater than 18 db down) and a low cross-polarization level (20 db or less); have a high gain (greater than 28 db above 2700 mc and greater than 15 db below 2700 mc); and have a low voltage SWR (less than 2:1). In general, the measured performance agreed well with theory: No major difficulties were encountered, and the only real problems that existed were the side-lobe level in the lowest frequency band and the beamwidth in the highest frequency band. In band A (940 to 2020 mc), the highest side-lobe level measured was 16.5 db below the peak energy level rather than the 18 db required. This value was not considered detrimental enough to the operation of the antenna to warrant changing the structure of the primary feed. In band D (8460 to 12,100 mc), the minimum measured beamwidth was 2.6° rather than the 3° minimum specified. This small difference is tolerable and will not impair the operation of the system. The antenna positioning system is in accordance with requirements. Tracking errors and acceleration values in all cases are well within the specified limits. The necessary follow-up devices are included. Special circuitry for the protection of equipment and operating personnel were designed into the over-all control circuitry.

Superior Tube Co., Norristown, Pa.
HIGH STRENGTH TUBULAR CATHODES FOR ELECTRON TUBES, by W. L. Hunsberger, R. B. Yeaton and C. D. Richard. Terminal technical rept. on Contract NObsr-63203. 19 Oct 56, 121p.
Order from LC mi$6.30, ph$19.80 PB 139 002

Using fourteen (14) alloying elements, ten (10) alloying series with nickel were investigated over selected composition ranges. The hot strengths of experimental alloys at cathode operating temperatures were evaluated by means of yield strength measurements. Results were found to correlate directly with shock tests performed on representative alloys mounted in a production 6AQ5 tube type.

Syracuse U. Research Inst., N. Y.
HIGH FREQUENCY MAGNETIC AMPLIFIERS, by Norman Balabanian and Joseph Dienst. Final rept. for 15 May 54-15 Nov 55 on Contract DA 36-039-sc-63095. 15 Dec 55, 91p. 51 refs. Rept. no. EE-303-5512F; AD-124 863.
Order from LC mi$5.40, ph$15.30 PB 138 954

An analysis of the amplistat circuit is presented based on a hysteresis loop in the shape of a parallelogram with flat top and sloping sides. The effect of loop width and rectifier reverse current on the control characteristic is determined qualitatively from the analysis. These effects are observed in the experimental results. A reactor design procedure is described based partly on the results of the analysis. Experimental data are presented for 1 watt and 5 wall amplistat circuits and for the self-saturating doubler circuit. The data include the control characteristic, power gain, time constant and figure of merit. Variations of these quantities with frequency, core material and rectifier type are shown. Most of the data are limited to 15 kc and lower but some data are given up to 40 kc.

Technical Research Group, New York.
NUCLEAR RESONANCE FILTERS FOR RADAR AND COMMUNICATIONS APPLICATIONS, by L. Goldmuntz and J. Rodriguez. Quarterly progress rept. no. 1, 15 June-15 Oct 56, on Contract DA 36-039-sc-72408. [1956] 39p. 1 ref.
Order from LC mi$3.00, ph$6.30 PB 139 101

The major effort has been the design and construction of electronic equipment to demonstrate the principle of "shimming" the magnetic field by a series of 180° pulses in order to obtain a synthetic homogeneous field in nuclear resonance induction experiments. A discussion is included of the physical principles underlying the shimming experiment and basic to the operation of the high Q filter we are trying to develop. There is also a discussion of the applications of a low noise figure high Q filter to radar and communication systems. The design of this equipment, the block diagrams and schematics are shown.

Technical Research Group, New York.
NUCLEAR RESONANCE FILTERS FOR RADAR AND COMMUNICATIONS APPLICATIONS, by R. T. Daly and M. Newstein. Quarterly progress rept. no. 2, 15 Oct 56-15 Jan 57, on Contract DA 36-039-sc-72408. [1957] 11p. 3 refs.
Order from LC mi$2.40, ph$3.30 PB 139 102

During this report period resonances without pulsed shimming have been observed in a glycerine sample (relaxation time, 20 milliseconds) in both fast passage and spin echo modes. In addition to checking out changes in the apparatus the experiments were directed toward a measurement of the external magnet inhomogeneity. A summary of the results is shown. (See also PB 139 101)

Technical Research Group, New York.
NUCLEAR RESONANCE FILTERS FOR RADAR AND COMMUNICATIONS APPLICATIONS, by R. T. Daly and M. Newstein. Quarterly progress rept. no. 3 for 16 Jan-31 Mar 57 on Contract DA 36-039-sc-72408. [1957] 35p. 3 refs. AD-130 608.
Order from LC mi$3.00, ph$6.30 PB 139 103

Modifications to the magnet pole pieces were made in an unsuccessful attempt to improve the field homogeneity. A new crossed-coil mount was completed which allows for the positional and angular adjustment of the sample coil. The electrical performance of the coils is consistent with simple calculations. Preliminary experiments with RF pulse trains applied to the nu-

clear sample have produced some interesting effects which seem to be a result of magnet inhomogeneity. The case of a sample consisting of 2 coupled spin systems is described briefly. It is shown that a steady state shimmed signal may be possible by a double resonance of the 2 spin systems. Work toward a demonstration of the transient shimming effect in a water sample continued. (See also PB 139 102)

Technical Research Group, Syosset, N. Y.
A PROBLEM IN ELECTRONIC SWITCHING OF MULTIPLE FEEDS FOR WIDE ANGLE REFLECTORS, by A. F. Kay, A. J. Simmons and others. Rept. on Contract AF 19(604)4054. Oct 58, 44p. 8 refs. Technical rept. no. 122-2; AFCRC TN-58-557; AD-160 866.
Order from LC mi$3.30, ph$7.80 PB 138 715

The problem is considered of packing along the focal curve of a reflector or lens multiple feeds which are large enough to provide a proper primary pattern and at the same time close enough together to give adequate secondary pattern overlap. Matched microwave switching networks which will switch on any q adjacent feeds in a line of N feeds are considered as one solution to the problem. Electromechanical, ferrite, and electronic switches are discussed with regard to their suitability for this function.

Tennessee U. Engineering Experiment Station, Knoxville.
THE IMPEDANCE OF FOLDED MONOPOLES USED IN CIRCULAR ANTENNA ARRAYS, by J. E. Brittain and J. D. Tillman. Scientific rept. no. 1 on Contract AF 19(604)4967. 1 Feb 59, 37p. 10 refs. AFCRC TN-59-113; AD-209 374.
Order from LC mi$3.00, ph$6.30 PB 139 222

This report contains a theoretical analysis of circular antenna arrays composed of coupled monopoles or folded monopoles. It is shown that the sequence impedances of a folded monopole array can readily be determined from the sequence impedances for the same array of simple monopoles, even in the non-resonant case. Experimental verification is included.

Texas Instruments, Inc., Dallas.
DIFFUSED SEMICONDUCTOR DEVICE NO. 19, by T. S. Edwards, W. A. Little and others. Final Feasibility rept. for 1 July 56-31 Dec 57 on Industrial Preparedness Study on Diffused Semiconductor Devices, Nos. 19, 23, and 28, Contract DA 36-039-sc-72703. 17 Jan 58, 77p.
Order from LC mi$4.50, ph$12.30 PB 138 771

A detailed analysis of the design, fabrication, and performance of the grown-diffused silicon triode transistor for Device No. 19 objective requirements is presented in this report, which covers the Phase I feasibility study of the subject contract. A complete description of the fabrication procedure is given together with the grown-diffused crystal growing process and the final package design.

Texas Instruments, Inc., Dallas.
DIFFUSED SEMICONDUCTOR DEVICE NO. 23, by William C. Brower, Robert E. Trueb and others. Quarterly rept. no. 1, 16 Apr-31 Dec 57, on Industrial Preparedness Study on Diffused Semiconductor Devices Nos. 19, 23, and 28, Contract DA 36-039-sc-72703. 14 Feb 58, 60p.
Order from LC mi$3.60, ph$9.30 PB 138 772

The transistor design has been studied with the aim of adapting present assembly methods to mass-production techniques. Tests on various alloy tab materials show that Kovar is the most suitable material for a transistor design that is economical and capable of being assembled on semi-automatic machinery.

Transistor Applications, Inc., Boston, Mass.
INVESTIGATION OF THE APPLICATIONS OF NEGATIVE RESISTANCE DIODES FOR SWITCHING CIRCUITS. Scientific rept. no. 3, 18 Sep-17 Dec 58 on Contract AF 19(604)3066. Apr 59, 35p. AFCRC-TN-59-198; AD-216-103.
Order from LC mi$3.00, ph$6.30 PB 142 804

This report is concerned with the study and investigation of Negative resistance devices and the following subjects are covered. Conditions allowing both NRD's in a two NRD flip-flop to conduct simultaneously are discussed. An NRD ring counter is described and design relationships presented. Waveforms in rings of 3 and 4 are shown. A symmetrical multivibrator using two NRD's is described. Measurements of V-I characteristics and waveforms are presented. A transistor NRD multivibrator capable of generating pulses and a linear ramp is analyzed. Waveforms in the circuit are shown. A transistor NRD flip-flop that may be triggered by positive pulses applied to one point in the circuit is described and waveforms shown. (See also PB 139 220)

Vitro Labs., Silver Spring, Md.
A SUMMARY OF RELIABILITY PREDICTION AND MEASUREMENT GUIDELINES FOR SHIPBOARD ELECTRONIC EQUIPMENT. Rept. on Contract NObsr-63389. 15 Apr 57, 38p. Technical rept. no. 98.
Order from LC mi$3.00, ph$6.30 PB 143 313

The purpose of this report is to provide a handbook containing summarized methods and guidelines for the prediction of electronic equipment reliability, and describing the method of measurement of electronic equipment reliability by means of analysis of the Bureau of Ships Electronic Equipment Failure Reports. This report contains all prediction guidelines developed to date and shows examples of their use. The guidelines presented supersede all previously published guidelines. Details of work performed in developing and testing these techniques and guidelines are set forth in Technical Report No. 97.

Vitro Labs., Silver Spring, Md.
TECHNIQUES FOR RELIABILITY MEASUREMENT AND PREDICTION BASED ON FIELD FAILURE DATA. Summary rept. on Electronic Equipment Reliability Program, Contract NObsr-63389. 30 Aug 57

(reprint). 94p. 5 refs. Technical rept. no. 80.
Order from LC mi$5.40, ph$15.30 PB 143 045

The objective is to develop a method for measuring the reliability of electronic equipment and the guide lines by which reliability can be predicted as early as the "drawing board." Data used included Bureau of Ships Electronic Failure Reports, supplemented by field observations. The measured reliabilities of selected equipment models were found to be correlatable with the number, type, and application of their components. Predictions based on these rough correlations appear to be of the proper order of magnitude.

Washington U., Seattle. Coll. of Engineering.
CONICAL SURFACE STUDIES, by Gedalia Held. Final rept. on Contract AF 19(604)1381. 1 July 58, 105p. 13 refs. AFCRC TR-58-147; AD-152 413.
Order from LC mi$5.70, ph$16.80 PB 138 798

This contains a general description of the efforts and achievements obtained. Parts of the work have appeared previously in the form of Technical Reports and parts appear here for the first time. The parts that were presented in Technical Reports in the past are presented in abstracted form only with references to the numbers and dates of the Technical Reports. The parts that appear here for the first time are presented in detail. These parts are given in the chapter on the Radiation Conductance of a Longitudinal Slot and the chapter on the Fields in a Conical Resonator. In the report one will find both experimental and theoretical studies on slot radiators on conical surfaces. These studies fall into three basic categories. (a) The nature of slot radiators and in particular, when they are located on a cone. (b) The interaction between slots on the cone and the tip of the cone. (c) The synthesis of slot arrays on conical surfaces to obtain certain desired patterns.

Westinghouse Electric Corp., Baltimore, Md.
EXPERIMENTAL HIGH POWER UHF LINK. Progress rept. no. 20, June 57, on Contract AF 30(602)1256. July 57, 7p. RADC-TN-57-298; AD-131 244.
Order from LC mi$1.80, ph$1.80 PB 143 046

(See also PB 136 684)

Whitney Blake Co., New Haven, Conn.
STUDY AND INVESTIGATION OF THE LIFE OF FLEXIBLE CORDS AND CORD ASSEMBLIES, by Irvine A. Hill. Final rept. for 27 Sep 54-27 Dec 56 on Contract DA 36-039-sc-64530. [1956] 66p. AD-130 301.
Order from LC mi$3.90, ph$10.80 PB 138 681

The investigation covered conductor materials, design factors, and preparation of final samples. Guides are presented for deciding on a cord design for meeting any of several conditions of service. It was established that in cords with only one size of conductor, and in which very low electrical resistance is not essential, tinsel conductors (such as Montgomery T-2049 tinsel) give the best over-all life. Tinsel conductors also tend to make a limp, lightweight cord. For combination cords, or for cords in which relatively low electrical resistance is essential, cadium-bronze stranded conductors give the best over-all life. Cadmium-bronze conductors make as limp a cord as one made with copper of equal tensile strength. Silverplated Copperweld, in hard temper, makes a stiff cord with good test life. High conductivity is the major advantage of copper in a flexible cord. Combination cords should be avoided wherever possible because of their susceptibility to premature failure. A short stranding lay design of cord affords the best life under most service conditions. A short cabling lay generally gives the best life in flexing or kinking and tends to make the cord limp. A long cabling lay tends to stiffen the cord, but increases the life on torsional twisting. For over-all service conditions where no one form of abuse is predominant, a medium cabling lay may be best. The type of cabling machine used and its effect must be considered in designing the cord and in establishing the lays.

Ordnance, Missiles, and Satellite Vehicles

Advanced Electronics Center, General Electric Co., Ithaca, N. Y.
AUTOMATION AND PERSONNEL REQUIREMENTS FOR GUIDED MISSILE GROUND SUPPORT FUNCTIONS, by W. B. Knowles. Rept. on Contract AF 41(675)170. May 59, 49p. 23 refs. WADC Technical rept. 59-240.
Order from OTS $1.25 PB 151 978

This report summarizes an investigation of the high skill level requirements found in missile systems employing automatic electronic test and checkout equipment. Automation has not resulted in lowering manpower demands because (1) testing and maintenance requirements and objectives have not been systematically defined and (2) manual operations have not been completely described or programmed. A "maintanance system" design approach is outlined as a method for overcoming these deficiencies. Further research is recommended in development of techniques for evaluating the design of test logic, maintenance operations, and manual tasks.

AER, Inc. [Pasadena, Calif.]
SOME EVALUATION WORK ON SNORT TRACK HORIZONTAL MOMENTUM-EXCHANGE WATER BRAKES, by T. Y. Wu and P. L. Leung. Rept. for Aug-Dec 55 on Contract and N123-60530S-4595A. Jan 59, 28p. 5 refs. Technical rept. 107 (114-3I-3); NOTS TP 2252; NAVORD rept. 6553.
Order from LC mi$2.70, ph$4.80 PB 142 808

The aim of the report is to establish a routine scheme, developed on a rational basis, which can be adhered to in future experimental evaluation work on horizontal momentum-exchange (HME) water brakes. Two simple methods are described for measurement of water velocity at the exit sections of the HME brake ducts. This quantity is of great importance in calculation of the braking force generated by HME brakes. There is also described a method for measuring the aerodynamic

drag of rocket test sleds. Contained in the report are discussions on the use of pressure pickups and weep holes, and on the reasons for the discrepancies between experimental and theoretical results. Finally, the results of the investigations are summarized in a set of four explicitly given recommendations.

Air Force Missile Development Center, Holloman AFB, N. Mex.
THE CALCULATION OF THE VELOCITY AND THE ACCELERATION OF THE ROCKET SLED FROM THE TIME-SPACE DATA BY THE METHOD OF LEAST-SQUARES POLYNOMIALS, by Alfred W. Simon. Apr 59, 17p. AFMDC TN-59-5; AD-211 524.
Order from LC mi$2.40, ph$3.30 PB 142 968

A method of calculating the velocity and acceleration of the center of gravity of the rocket sled from the center of gravity of the rocket sled from measured time versus distance travelled on the Holloman Track is presented using the least-squares method to reduce the residual errors in measurement and to provide a most probable solution.

Air Force Missile Development Center, Holloman AFB, N. Mex.
ON SATELLITE ORBITS III: THE INFLUENCE OF ROTATIONALLY UNSYMMETRIC GRAVITATIONAL ANOMALIES ON A SATELLITE ORBIT, by Herbert Knothe. June 59, 16p. AFMDC TR-59-20; AD-215 273.
Order from LC mi$2.40, ph$3.30 PB 143 185

It is shown that small rotationally unsymmetric gravitational anomalies can turn the orbit plane into the stable position of the equator plane in two different ways: (1) Monotonic decrease of the inclination of the orbit until it reaches zero and (2) Monotonic increase of the inclination until it reaches π. (See also PB 140 318)

Antenna Systems Lab., U. of New Hampshire, Durham.
DETECTION AND ANALYSIS OF RADIO SIGNALS FROM SPACE VEHICLES, by Albert D. Frost and Donald W. Melvin. Scientific rept. no. 1 on Contract AF 19(604)3892. 15 June 59, 23p. 6 refs. AFCRC TN-59-378; AD-217 858.
Order from LC mi$2.70, ph$4.80 PB 143 198

Facilities have been set up for the measurement of the Doppler shift in the received radio signal from earth satellite vehicles as part of a multi-station Doppler tracking technique. Perturbations due to modulation or ionospheric distortion in the signals from Delta 1958 and Epsilon 1959 have caused the experiment to date to be inconclusive. A frequency measurement technique applicable to pulsed or fading signals is described. Work is now in progress on the development of parametric amplifiers in microwave strip line form.

Ballistic Research Labs., Aberdeen Proving Ground, Md.
JUMP DUE TO AERODYNAMIC ASYMMETRY OF A MISSILE WITH VARYING ROLL RATE, by C. H. Murphy and J. W. Bradley. May 59, 30p. 5 refs. Rept. no. 1077.
Order from LC mi$2.70, ph$4.80 PB 143 145

Although the theory of aerodynamic jump for essentially symmetric missiles with slight aerodynamic asymmetry and constant roll is well known, the dependence of this jump on varying roll has not been considered. If roll is produced by differentially canted controls, the rolling motion can be described by two parameters. The magnitude and orientation of jump is presented for the pertinent range of these parameters.

Ballistic Research Labs., Aberdeen Proving Ground, Md.
ON THE MECHANISM OF DISPERSION AND SHORT RANGES OF MORTAR FIRE WITH AN APPENDIX ON THE ALTERNATE SOLUTION OF THE EQUATIONS OF MOTION OF A YAWING PROJECTILE, by Serge J. Zaroodny. 7 Apr 48, 37p. 11 refs. Rept. no. 668.
Order from LC mi$3.00, ph$6.30 PB 142 855

An hypothesis is stated which may explain the occurrence of short ranges (and generally, the mechanism of dispersion) of mortar fire. It is postulated (a) that the Magnus torque coefficient is negative and of a sufficient magnitude, and (b) that there exists a spin accelerating torque proportional to the scalar product of cross-velocity and cross-spin. The latter torque is of the "second order" in the sense of BRL 446, but it acts continuously and its effects accumulate. The short ranges are explained by spin, and the acquisition of spin is explained by the existence of this torque and by suitable conditions of launching, viz., by an initial spin or by an ellipticity of the initial yaw. An accidental twist of the fins may be one of these conditions, but is not essential. If proven, this theory may not only eventually furnish a rational basis for the design of mortar materiel and ammunition, but also be applicable to all fin stabilized projectiles.

Ballistic Research Labs., Aberdeen Proving Ground, Md.
AN OPTICAL METHOD FOR STUDYING THE EARTH'S HAZE HORIZON FROM HIGH ALTITUDES, by T. R. Bechtol. Aug 58, 75p. Memo. rept. no. 1163.
Order from LC mi$4.50, ph$12.30 PB 138 787

A photographic technique is described for determining the vertical stability of the haze horizon as a function of various parameters such as large land masses at the horizon, altitude of the observing station, sun illumination angle, meteorological conditions, and wavelength of light used in making the observations. The technique uses a specially developed horizon camera for obtaining photographs of the haze horizon and a mapping camera for determining the orientation of the horizon camera at the times of exposures. In this report are discussed the nature of the experiments, the development of the apparatus, the solution of problems arising from operations in the stratosphere, and the performance of the apparatus in the field. Data reduction and analysis of

the results obtained from experiments conducted thus far are published in BRL Memorandum Report No. 1164.

Ballistic Research Labs., Aberdeen Proving Ground, Md.
A SIMPLE MECHANICAL METHOD FOR MEASURING THE REFLECTED IMPULSE OF AIR BLAST WAVES, by O. T. Johnson, J. D. Patterson, II, and W. C. Olson. July 57, 40p. 8 refs. Memo. rept. no. 1088; AD-149 358.
Order from LC mi$3.00, ph$6.30 PB 139 242

A mechanical method is described for measuring the impulse imparted to a flat rigid surface by the reflection (at 90^{o} or normal incidence) of an air blast wave. The method consists of measuring the velocity at which a cylindrical plug of known mass is projected from a hole in a large rigid surface by the blast wave. With the velocity known, the impulse is computed by means of Newton's second law. Experimental results were obtained for spherical Pentolite explosive charges ranging from 1/4 to 2 lb and scaled distances from 0.5 to 2.5 $ft/lb^{1/3}$. The results showed the usefulness of the moving plug technique for measuring reflected, scaled impulses close to explosive charges.

Ballistic Research Labs., Aberdeen Proving Ground, Md.
SUMMARY OF DOPPLER SATELLITE TRACKING OPERATIONS DURING THE FIRST WEEK AFTER 1958 ALPHA LAUNCH. HIGH ALTITUDE INSTRUMENTATION REPORT NO. II, by Bedford T. Bentley, Raymond E. Prenatt and L. G. de Bey. Oct 58, 22p. 1 ref. Technical note no. 1224.
Order from LC mi$2.70, ph$4.80 PB 139 091

Operation of the BRL Satellite Tracking Station during launch and during the first week after launch of 1958 Alpha is discussed. Briefly described are the tracking instrumentation and data reduction. A tabulation of pass times, slant ranges, and transmitter frequency is included.

Ballistic Research Labs., Aberdeen Proving Ground, Md.
THEORY OF THE SPIN OF A CONDUCTING SATELLITE IN THE MAGNETIC FIELD OF THE EARTH, by John P. Vinti. July 57, 63p. 14 refs. Rept. no. 1020; AD-149 360.
Order from LC mi$3.90, ph$10.80 PB 139 244

A theoretical investigation is carried out of the spin of a conducting satellite in the magnetic field of the earth. It is found that interaction of the induced eddy currents with the earth's field produces not only a torque of spin decay but also a torque tending to turn the axis of spin. For motion in a constant magnetic field the component of spin parallel to the field would remain constant, but the perpendicular component would diminish exponentiallv.

Bureau of Yards and Docks, Washington, D. C.
ORDNANCE FACILITIES. 1 June 54. 41p. Technical pub. NAVDOCKS TP-Pw-21.
Order from LC mi$3.30, ph$7.80 PB 142 885

This publication provides guidance to personnel charged with the planning, design, construction, alteration, repair, and maintenance of ordnance facilities. Special consideration is given to safety precautions, particularly those designed to assure safety in the design and location of structures for the storage, handling, and issue of high explosives and ammunition. Part A states the Bureau's authority, policy, and responsibilities for providing facilities to meet requirements, and defines various technical terms used in this publication. Part B presents the general considerations affecting the construction of ammunition depots, including site selection, station mission, storage and transportation problems, station layout, and security and safety. Part C gives technical criteria on the design of various types of loading plants, including the buildings required for their successful operation. Part D covers the design of the types of magazines required for the safe storage of high explosives and various kinds of ammunition. Part E is concerned with the special problems involved in constructing ordnance facilities at Naval Air Stations.

Coating and Chemical Lab., Aberdeen Proving Ground, Md.
COMPOSITION FOR REMOVING RUST AND GREASE FROM FERROUS SURFACES AT AMBIENT TEMPERATURES, by M. H. Swann. 22 Jan 58, 8p. CCL #45.
Order from LC mi$1.80, ph$1.80 PB 143 113

A formula was developed for removing light rust and all types of grease and oil from ferrous surfaces at ordinary room temperatures, and can be supplied in concentrated form for dilution with water to facilitate shipping and storing.

Diamond Ordnance Fuze Labs., Washington, D. C.
FUZE BALANCES FOR CENTER OF GRAVITY DETERMINATIONS, by Daniel J. Grant. 25 Feb 59, 19p. TR-687.
Order from LC mi$2.40, ph$3.30 PB 142 911

Two fuze balances--a small fuze balance and a missile fuze balance--were designed and fabricated. The balances are used in the laboratory to determine center of gravity. The small fuze balance can be used with items weighing as much as 2 kg, and the missile fuze balance can be used with items weighing as much as 125 lb. Determinations including simple calculations can be made in about 15 min. The device can be adapted by the use of transducers and simple computers to make automatic determinations in about a minute.

Fréjacques, Claude and Leclercq, Marius
MEASUREMENT BY THERMOBALANCE OF THE VOLATILITY OF PROPELLANT PLASTICIZERS, tr. by George R. Loehr. Aug 57 [12]p. Picatinny Arsenal Translation no. 15.
Order from LC mi$2.40, ph$3.30 PB 135 435T

Trans. of Mémorial des Poudres (France) 1955, v. 37, p. 153-162.

Weight loss of propellants was continuously recorded with a Testut thermobalance on samples kept in an

oven controlled thermostatically by an air-stream. Various measurement factors were investigated. This led to the determination of a coefficient of volatility for each plasticizer. These coefficients which did not vary much for the same type of propellant, make it possible to classify the different plasticizers. (Author's summary)

General Electric Co., Syracuse, N. Y.
SATELLITE TRACKING BY RADIO. Interim rept. no. 1, pt. 1 on Contract AF 19(604)4087. 7 Apr 59, 32p. 3 refs. AFCRC-TN-59-374.
Order from LC mi$3.00, ph$6.30 PB 143 025

This document is Part I of a two-part report describing one aspect of the work done under contract AF19 (604) 4087 for the Air Force Cambridge Research Center, Electronic Research Directorate, by the General Electric General Engineering Laboratory under sponsorship of G. E. 's Heavy Military Equipment Department. Part I presents the results of a mathematical study of tracking methods and recommendations for further analytical work. Part II of the report will describe the tracking installation that was established near Schenectady, New York under the contract.

Institute of Metals and Explosives Research, U. of Utah, Salt Lake City.
ELECTRICAL FIELDS AND ELECTROMAGNETIC RADIATION FROM CHEMICAL EXPLOSIONS, by M. A. Cook, R. T. Keyes, and E. F. Pound. Rept. on Contract AF 18(603)100. 19 Mar 59, 56p. 7 refs. AFOSR TN-59-551; AD-216 691.
Order from LC mi$3.60, ph$9.30 PB 142 872

Electrical fields and electromagnetic radiation generated by chemical detonations of charges ranging in size from 10g to roughly 25 kg were investigated over a frequency range extending from a few cycles per second to 500 megacycles per second. The electrical potentials of the expanding explosion products were estimated, and for a 552g 50/50 pentolite charge the maximum value was determined to be 18,000 volts. For bare charges this quantity was considered to vary roughly in direct proportion to the charge weight. Experiments are described which were performed to ascertain the mechanism whereby the electrical fields and EM radiation are generated by chemical detonations, and a model is proposed.

Mallory, P. R., and Co., Inc., Indanapolis, Ind.
PRINCIPLES AND TECHNIQUES OF INTEGRATION AND PACKAGING OF PRINTED CIRCUIT ASSEMBLIES FOR MISSILE APPLICATIONS, by R. L. Meek, J. P. Morone, Jr., and L. R. Whitaker. Final rept. for 1 July 54-31 July 56 on Contract DA 36-039-sc-64451. [1956] 250p. 50 refs. AD-138 302.
Order from LC mi$11.10, ph$37.80 PB 138 770

A program was conducted to establish principles and techniques for packaging and integrating "autosembled" subassemblies for missile applications involving severe shock or vibratory environments. Experimental assemblies demonstrating the application of these principles and techniques were fabricated, tested, and evaluated. In nearly all cases, specific examples of suggested procedures are illustrated and/or discussed. Problems and attempted solutions are discussed that are related to the various tasks into which the program was divided: integration, ruggedization, size and weight, thermal adequacy, climatic protection, and maintenance.

Naval Ordnance Lab., White Oak, Md.
THE ATTENUATION OF AIR BLAST BY RAIN. PART I: THE EFFECT OF WATER CONTENT IN AIR ON THE PEAK SHOCK OVERPRESSURES PRODUCED BY SMALL CHARGES, by Paul Z. Kalavski. 2 Feb 59, 16p. 6 refs. NAVORD rept. 3646; AFSWP-1121.
Order from LC mi$2.40, ph$3.30 PB 142 749

Measurements have been made of the peak shock overpressures produced by 472-gram spheres of pentolite exploded in artificial rains. The water concentrations (grams of water/cubic meter of air) have been varied from 10 to 144. Comparison of the measured pressure-distance curves with the free-air curve (in the absence of rain) indicates that the attenuation produced by the rainfalls varies from about 4% to 31% over the water-concentration range employed.

Naval Ordnance Test Station, China Lake, Calif.
HYDROLYSIS OF NITROGUANIDINE AND NITROAMINOGUANIDINE, by William R. McBride, Ronald A. Henry and Sol Skolnik. 27 Jan 53, declassified 6 Aug 58. 46p. 23 refs. NOTS-642; NAVORD rept. 2011.
Order from LC mi$3.30, ph$7.80 PB 142 982

The hydrolysis of nitroguanidine and nitroaminoguanidine in aqueous solution was investigated in the temperature range of 60 to 90°C. The rates of hydrolysis for both compounds were determined for acid-, neutral-, and alkaline-buffered solutions; the rates increased with alkalinity. Guanidine, urea, and ammonia are degradation products in alkaline-buffered solutions of nitroguanidine. Nitroaminoguanidine undergoes several forms of decomposition: hydrolysis, air-oxidation, and inter- or intramolecular oxidation-reduction or condensation. Decomposition of nitroaminoguanidine under both nitrogen and air was studied; the difference between the two rates was the extent of the air-oxidation. Semicarbazide, hydrazine, and ammonia are hydrolysis products in alkaline-buffered solution of nitroaminoguanidine. Reactions are postulated to account for the hydrolysis of both nitroguanidine and nitroaminoguanidine in the aqueous solutions studied.

Naval Ordnance Test Station, China Lake, Calif.
LECTURES ON INSTRUMENTATION AND TEST TECHNIQUES IN ORDNANCE DEVELOPMENT, by A. B. Dember. Dec 58, 354p. 53 refs. NOTS TP-2120.
Order from LC mi$11.10, ph$54.60 PB 142 921

A survey of experiment design and instrumentation used in optical and electronic trajectory measurements, telemetering, aircraft flight testing and fire control systems, aeroballistics, torpedo development,

underwater acoustic measuremements, rocket propulsion, study of explosive phenomena, environmental testing, flight simulation on high-speed tracks, warhead testing, influence fuze testing, infrared radiation and microwave measurements, study of hypervelocity particles, propellant inspection, hybrid data systems, data automation, and ordnance testing with x-rays and gamma rays.

Naval Ordnance Test Station, China Lake, Calif.
TEST ANALYSIS OF A CONTRAROTATING MOTOR WITH TWO ARMATURES, by John H. Watkins. 14 May 57, 31p. 1 ref. NOTS-1761; NAVORD rept. 5565.
Order from LC mi$3.00, ph$6.30 PB 139 304

A contrarotating double-armature d.c. motor was designed and constructed at the Naval Ordnance Test Station. The motor was an outgrowth of a NOTS-initiated research program on electric propulsion for modern high-speed torpedoes. The investigative techniques during the laboratory testing of this motor were applied to determine its practicability and effectiveness and to isolate those areas where improvement in design and construction would result in the performance required of a torpedo propulsion plant.

[Naval Weapons Plant] Washington, D. C.
DEVELOPMENT OF NOTCH-DUCTILE STRESS-RELIEVED WELD-METAL FOR THE FABRICATION OF DYNAMICALLY-LOADED T-1 STEEL STRUCTURES, by J. S. Kobler. 30 Apr 59, 64p. 4 refs. NGF-T-1-59; NAVORD rept. 6491; AD-216 940.
Order from OTS $1.75 PB 151 990

A notch-sensitive fusion-zone observed in stress-relieved T-1 steel welds was attributed to chemical incompatibility resulting from liquid dilution and partial solid state diffusion of the weld-base metal-complex. Obviation of this metallurgical defect was a prerequisite to fabrication of a shipboard missile launching system designed to withstand dynamic loading at low operating temperature. Electrodes were developed capable of depositing compatible stress-relieved weld-metal yielding uniform energy absorption values, equivalent to those observed in base-metal, through all zones across a T-1 weld-joint. Consideration of the fusion zone phenomenon as a major weldability concept in welding of high strength steels was recommended.

[Naval Weapons Plant] Washington, D. C.
PERFORMANCE TEST OF SEALS, OIL, PLAIN OR PLAIN ENCASED FOR SHAFT SIZES 0.875, 2.625 AND 3.50 INCHES MANUFACTURED BY CHICAGO RAWHIDE MANUFACTURING CO., CHICAGO 22, ILL., by Milton Hill. 12 May 58, 17p. NAVORD rept. 5533; NGF T-7-58; AD-203 249.
Order from LC mi$2.40, ph$3.30 PB 143 239

See also PB 143 240

[Naval Weapons Plant] Washington, D. C.
PERFORMANCE TEST OF SEALS, OIL, PLAIN OR PLAIN ENCASED FOR SHAFT SIZES 0.875, 2.625 AND 3.50 INCHES MANUFACTURED BY JOHNS MANVILLE, NEW YORK 16, N. Y., by Milton Hill. 16 May 58, 17p. NAVORD rept. 5531; NGF-T-5-58; AD-203 247.
Order from LC mi$2.40, ph$3.30 PB 143 238

See also PB 143 237

[Naval Weapons Plant] Washington, D. C.
PERFORMANCE TESTS OF SEALS, OIL, PLAIN OR PLAIN ENCASED FOR SHAFT SIZES 0.875, 2.625 AND 3.50 INCHES MANUFACTURED BY THE GARLOCK PACKING CO., PALMYRA, N. Y., by Milton Hill. 12 May 58, 16p. NAVORD rept. 5534; NGF T-8-58; AD-203 248.
Order from LC mi$2.40, ph$3.30 PB 143 240

See also PB 143 238

[Naval Weapons Plant] Washington, D. C.
PERFORMANCE TEST OF SEALS, OIL, PLAIN OR PLAIN ENCASED FOR SHAFT SIZES 0.75, 2.625 AND 3.50 INCHES MANUFACTURED BY THE NATIONAL SEAL DIVISION, FEDERAL-MOGUL-BOWER BEARINGS, INC., REDWOOD CITY, CALIF., by Milton Hill. 11 Apr 58, 15p. NAVORD rept. no. 5529; NFG T-3-58; AD-203 252.
Order from LC mi$2.40, ph$3.30 PB 143 236

The object of these tests was to determine the operational and physical characteristics, of seals, oil, plain or plain encased when tested in accordance with Military Specification proposed 10 April 1956, superseding NAVORD OS 1277A, 13 May 1943.

[Naval Weapons Plant] Washington, D. C.
PERFORMANCE TEST OF SEALS, OIL, PLAIN OR PLAIN ENCASED FOR SHAFT SIZES 0.875, 2.625 AND 3.50 INCHES MANUFACTURED BY VICTOR MANUFACTURING AND GASKET CO., CHICAGO 50, ILLINOIS, by Milton Hill. 19 May 58, 16p. NAVORD rept. 5530; NGF-T-4-58; AD-203 251.
Order from LC mi$2.40, ph$3.30 PB 143 237

See also PB 143 236

Picatinny Arsenal, Dover, N. J.
APPLICABILITY OF TIME-TEMPERATURE SUPERPOSITION PRINCIPLE TO CELLULOSE NITRATE (MECHANICAL PROPERTIES OF PROPELLANTS) by Elsie McAbee. May 54, 28p. 3 refs. Technical rept. 2022.
Order from LC mi$2.70, ph$4.80 PB 139 186

A preliminary investigation was conducted to determine whether or not the time-temperature superposition principle could be utilized with double base propellants in order to predict either impact or creep performance from low rate tests. For this initial work cellulose nitrate plastic was chosen because of convenience. A constant deformation test under compression was utilized to obtain the load-time data at a predetermined strain. The time-temperature superposition principle was not applicable to the cellulose nitrate plastic tested and does not seem likely to be applicable to cellulose nitrate propellants.

Pitman-Dunn Labs. Group, Frankford Arsenal, Philadelphia, Pa.
ANALYSIS OF THE ENERGY BALANCE OF M5 CATAPULT, by J. E. Brozek. Aug 58, 40p. 7 refs. Memo. rept. no. MR-686.
Order from LC mi$3.00, ph$6.30 PB 142 746

The energy balance of the M5 catapult, for a limited number of experimental conditions, has been analysed mathematically. Assumptions as to the burning process, development of chemical energy, and the thermodynamic behavior of the propellent gases have been made and such quantities as the amount of propellent gas, web fraction, gas temperature, and energy loss as function of time have been computed. The mathematical computations have been performed by a digital computer (Univac #409-2). The procedure followed in the preparation of performance data for analysis and the results of the analysis of a limited number of cases are presented in this report.

Pitman-Dunn Labs. Group, Frankford Arsenal, Philadelphia, Pa.
OVERLAY CASTING OF ROTATING BANDS ON SHELL, HE, 90mm, M71, by L. Polonsky. Aug 58, 11p. Rept. MR-687.
Order from LC mi$2.40, ph$3.30 PB 138 789

Procedures have been developed for casting a rotating band on a 90 mm artillery shell. Gilding metal (90 Cu-10 Zn) bands requiring a minimum of finish-machining were cast, utilizing the carbon dioxide molding process. Preliminary studies indicate that the properties of cast bands, with the exception of hardness, meet the requirements specified for this application (40,000 psi maximum ultimate tensile strength, 40.0 per cent minimum elongation). Minute cracks were found in several cast-on bands.

Purdue U. School of Aeronautical Engineering, Lafayette, Ind.
SOME VARIATIONAL SOLUTIONS TO ROCKET TRAJECTORIES OVER A SPHERICAL EARTH, by Angelo Miele and James O. Cappellari, Jr. Rept. on Contract AF 18(603)69. Nov 58, 31p. 10 refs. Rept. no. A-58-9; AFOSR TN-58-1012; AD-206 155.
Order from LC mi$3.00, ph$6.30 PB 139 148

General equations are presented for analyzing the optimum flight paths of rocket-powered vehicles. The Earth is assumed to be spherical and rotating; the variability of the acceleration of gravity with the altitude is accounted for. Attention is devoted to three special classes of trajectories, i.e., constant altitude paths, vertical paths, and gliding paths.

Rock Island Arsenal Lab., Ill.
DECALS FOR USE ON ORDNANCE ITEMS, by T. Rice and T. Turner. 6 May 59, 18p. Rept. no. 59-1247; AD-215 939.
Order from LC mi$2.40, ph$3.30 PB 143 061

Tests have been conducted on three types of decals: water, solvent, and cement applied with and without topcoats of clear lacquer and clear varnish. Four test procedures have been used for estimating the durability of the three types of decals, namely: (1) hydrocarbon solvent immersion; (2) humidity-cold cycle; (3) accelerated light and water; and (4) outdoor exposure. Tests indicate durability of the decals in the following order: best, (1) cement applied; next (2) solvent applied; least, (3) water applied. Topcoats increase durability of each type. Topcoats are not required for good grade decals for average interior use, but should be used over decals exposed to high humidity and severe outdoor exposure conditions. A revision of Federal Specification UU-D-171, "Decals" with inclusion of MIL-D-8634A and MIL-D-8635A in one specification is recommended.

Rodman Lab., Watertown Arsenal, Mass.
UTILIZATION OF LOW-FREQUENCY INDUCTION HEATING FOR CYLINDRICAL COMPONENTS, by A. M. Ayvazian. Jan 59, 35p. 5 refs. Technical rept. RPL-32/4.
Order from LC mi$3.00, ph$6.30 PB 138 827

Heat treating of cylindrical components by 60 cycle induction heating appears feasible.

Springfield Armory, Mass.
DIRECT READING RATE RECORDER: REPORTS CONTROL SYMBOL ORDTX-10, by George Salame. Rept. on Gun, Automatic, 20mm, T171, Contract DA 19-059-ORD-2548. 4 Apr 57, 26p. 1 ref. Rept. SA-TR20-2501; AD-145 867.
Order from LC mi$2.70, ph$4.80 PB 138 854

The chronographic rate measuring equipment described in this report indicates in decimal numbers the average and terminal rates of a weapon immediately after a burst has been fired. The equipment also incorporates a single-frame 35 mm camera which records an instantaneous rate curve from which acceleration and stopping rates can be obtained. A further feature of the system is an automatic weapon drive-motor de-energizer that shuts off the motor at a predetermined counter setting. Measurements taken with this equipment are accurate to within 0.1 percent.

Springfield Armory, Mass.
PRACTICAL HEAT TREATMENT PROCEDURES FOR TITANIUM ALLOYS AS APPLIED TO SMALL ARMS, by E. H. Abbe and G. L. Underhill. Summary rept. 1950-1956 on Gun, Automatic, 20mm, Revolver Type, Contracts DA 19-059-ORD-(2548, 2698). 21 Mar 58, 19p. Rept. SA-TR19-1201.
Order from LC mi$2.40, ph$3.30 PB 138 828

This report summarizes studies conducted to obtain data to develop practical heat-treatment procedures for titanium alloys for small arms in order to produce certain desired physical properties. Heat-treatment procedures are given, and test results discussed.

Tranchant, Jean
RECRYSTALLIZATION OF PETN FOR CORDEAUX EXPLOSIVES, tr. by George R. Loehr. June 57 [9]p. Picatinny Arsenal Translation no. 13.
Order from LC mi$1.80, ph$1.80 PB 135 531T

Trans. of Mémorial des Poudres (France) 1955, v. 37, p. 121-126.

An investigation was made of a process for crystallizing PETN into very short or hexagonal needle-shaped crystals, for use in detonating cord. By this process, a good yield of crystals having the desired granulation and purity was produced. This purity was obtained by first forming a suspension in water of a solution of PETN in nitromethane and then distilling off the azeotropic water-solvent mixture. (Author)

FOOD, HANDLING, AND PACKAGING EQUIPMENT

National Presto Industries, Inc., Eau Claire, Wis.
DESIGN STUDY OF INTERMEDIATE SIZE PRESSURE COOKER, by M. C. Smith and L. H. Neff, Jr. Final rept. for 27 Dec 56-26 Aug 57 on Contract DA 19-129-qm-831. [1957] 82p. 4 refs. AD-143 142.
Order from LC mi$4.80, ph$13.80 PB 138 867

The report consolidates the design calculations, design analysis, design sketches, test reports and other pertinent data used as a basis for the design of an intermediate size pressure cooker and includes a complete set of assembly and detail drawings as well as a parts list and bill of material for the proposed Pressure Cooker. Portions of this report are illegible.

MACHINERY, FABRICATION, AND ACCESSORY EQUIPMENT

Aero Medical Lab., Wright Air Development Center, Wright-Patterson AFB, Ohio.
A SYSTEM FOR MEASURING THE HIGH SOUND PRESSURE LEVELS FROM ROCKETS, by Lothar O. Hoeft. Rept. on Development of Special Research Methods and Equipment. Dec 56, 47p. 10 refs. WADC Technical rept. 56-655; AD-110 669.
Order from LC mi$3.30, ph$7.80 PB 138 989

In order to obtain far and near field noise characteristics in the short firing time of rocket engines a 21 channel sound recording system was developed with all tape recorders and other instrumentation located in the trailer housed Mobile Acoustics Laboratory. Selection of microphones and other components, testing of the equipment and its calibration up to 195 db re .0002 microbar are discussed. Emphasis is put on reliability of the system for field use; the procedures found practical for the actual field tests are therefore described in detail and the system used for analyzing the data is also given.

Astro Div., Marquardt Aircraft Co., Van Nuys, Calif.
RESEARCH ON STAGES OF AXIAL FLOW COMPRESSORS TO ALLEVIATE HARD STALL CHARACTERISTICS, by C. Lindley, A. Mager, and A. Jackola. Rept. on Contract AF 33(616)3555. Dec 58, 135p. 15 refs. WADC Technical rept. 58-561; AD-211 652.
Order from OTS $2.75 PB 151 872

An analytical and experimental investigation was made of the hard stall of axial flow compressors. Certain modifications of Rannie's theory of the rotating stall are shown to result in a unified treatment of the rotating stall, which encompasses many heretofore advanced theories. Analysis indicates the existence of a certain constant characteristic pressure coefficient for each form of stall for each compressor. The existence of this constant pressure coefficient implies that for each form of stall encountered, a new loss mechanism has come into play. A large, well-designed test rig for rotating stall studies was constructed and shaken down. A study was made of the possibility of devices to avert or minimize the effect of the abrupt stall. An anticipatory stall sensing device is suggested, but experimental studies of its effectiveness were not made.

Naval Ordnance Test Station, China Lake, Calif.
SCREW EXTRUSION OF PROPELLANT. PART 5. SCREW EXTRUSION THEORY WITH APPLICATIONS TO DOUBLE-BASE PROPELLANT, by Melbourne L. Jackson. 15 Jan 58, 50p. 13 refs. NOTS 1801; NAVORD rept. 2064, pt. 5; AD 156 254.
Order from LC mi$3.30, ph$7.80 PB 142 860

Three types of material flow through screw presses are observed. The theory of solid flow is developed with applications to semi-solid flow. The performance of screw presses for solid flow is much different from that for viscous flow. For double-base propellant the viscosity is so high that slip occurs at the confining walls and semi-solid flow results. Pressure development is exponental with consolidation length, and short screw lengths may be employed. Throughput is a function of the material angle, a new variable for press performance which, in turn, depends on the coefficients of friction. On the basis of the experimental data cited, the design of presses for solid and semi-solid flow and the scale-up of propellant extruders are discussed.

Rocket Research Lab., Ohio State U. Research Foundation, Columbus.
DETONATION INDUCTION DISTANCES IN COMBUSTIBLE GASEOUS MIXTURES AT ATMOSPHERIC AND ELEVATED INITIAL PRESSURES. I. METHANE-OXYGEN. II. CARBON MONOXIDE-OXYGEN. III. HYDROGEN-OXYGEN, by Loren E. Bollinger and Rudolph Edse. Final technical rept. on Research on the Fluid Dynamics of Rocket Combustion, Contract AF 33(616)5615. Mar 59, 98p. 7 refs. RF no. 822; WADC Technical rept. 58-591; AD-208 325.
Order from OTS $2.25 PB 151 873

Detonation induction distances in methane-oxygen and carbon monoxide - oxygen mixtures have been measured in a 15-mm diameter tube for various fuel concentrations at initial pressures of 1, 5, 10, and 25 atmospheres and an initial temperature of 40°C. The induction distance decreases with increasing initial pressure for all fuel concentrations investigated. However, the decrease in length with increasing pressure inversely follows the variation of burning velocity with pressure.

Rocketdyne [Canoga Park, Calif].
INVESTIGATION OF DIRECT CONVERSION DEVICES FOR APPLICATION TO ION PROPULSION, by A. L. Huebner. Rept. on Contract AF 49(638)344. May 59, 45p. 12 refs. Rept. R-1463; AFOSR-TN-59-461; AD-215 266.
Order from LC mi$3.30, ph$7.80 PB 142 874

The merit of the photovoltaic cell, which represents a power producing device characterized by an extremely high reliability, is analyzed. The theory of photovoltaic cells is developed briefly, and the important parameters affecting the operation of the cells are discussed, particularly with respect to conversion efficiency, operating temperature, and specific weight. On the basis of the aggregate information available, the applicability of photovoltaic cells to ion propulsion is discussed and the important factor of improvement in cell technology with time is examined.

Utah U., Salt Lake City.
IGNITION OF COMPOSITE PROPELLANTS, by A. D. Baer, N. W. Ryan, and D. L. Salt. Rept. on Contract AF 49(638)170. Mar 59, 75p. 11 refs. AFOSR TN-59-516; AD-216 291.
Order from LC mi$4.50, ph$12.30 PB 142 873

A principal objective of the project, as originally conceived, was to investigate the conditions under which aerodynamic shock will ignite composite solid rocket propellants. Four different propellants, three containing ammonium perchlorate and one containing ammonium nitrate, were exposed in a shock tube to conditions behind reflected shock waves. There is no evidence in this study that the shock waves participated in ignition of properly restricted propellants other than to supply hot reactive gas. However, the three perchlorate propellants ignited under much milder conditions when restrictor failure permitted the shock to travel down narrow channels bounded by propellant surface. The ammonium nitrate propellant could not be ignited by the shock tube techniques.

Manufacturing Equipment and Processes

Aeroprojects, Inc., West Chester, Pa.
EXPLORATORY RESEARCH ON THE APPLICATION OF ULTRASONICS TO SPOTWELDING, by J. B. Jones, F. J. Turbett and J. V. Kane. Rept. on Contract NOa(s)-10459. Aug 50, 72p. Research rept. no. 50-5.
Order from LC mi$3.00, ph$8.75 PB 143 546

Effects of ultrasonics on the spotwelding of 24S-T Alclad aluminum alloy. Positive results were achieved only in the 15 kc tests. Improvements were noted in the average and minimum shear strengths, in the coefficients of variation, and in the incidence of cracks. In certain instances, the microstructure of the ultrasonically treated spotwelds indicated grain refinement, more random orientation of the cast structure, and a blending of the cast metal into the wrought grains of the rolled sheet.

Carnegie Inst. of Tech. Graduate School of Industrial Administration, Pittsburgh, Pa.
APPROXIMATION OF A MULTIPLE TRIGGER FOR ITEM INVENTORY DECISIONS, by Peter R. Winters. O. N. R. Research memo. no. 58 on Contract Nonr-760(01). 25 Apr 58, 27p. 8 refs.
Order from LC mi$2.70, ph$4.80 PB 142 917

This memorandum gives an approximation to the multiple trigger rule originally presented in ONR Memorandum No. 55, which is an implicit function of the inventory levels at several warehouses. This function takes a relatively long time to evaluate. The approximation given in this paper is one that may be easily and quickly used in making actual day-to-day inventory and production decisions.

Carnegie Inst. of Tech. Graduate School of Industrial Administration, Pittsburgh, Pa.
A COMPUTER PROGRAM: LINEAR DECISION RULE FOR PRODUCTION AND EMPLOYMENT SCHEDULING (IBM 650), by Wesley Folsom and Charles C. Holt. ONR Research memo. no. 53 on Planning and Control of Industrial Operations, Contract Nonr-760(01). 12 June 57. 26p. 9 refs. AD-134 654.
Order from LC mi$2.70, ph$4.80 PB 138 950

Optimal linear rules have been derived for making decisions on aggregate production and employment utilizing quadratic cost functions. The calculations of these decision rules from the cost coefficients usually require about a day and a half on a desk calculator. The computer program whose use is described in this paper reduces the computation to a few minutes on an electronic digital computer.

DuMont, Allen B., Labs., Inc., Clifton, N. J.
INDUSTRIAL PREPAREDNESS STUDY FOR DIRECT VIEWING STORAGE TUBES, by M. P. Wilder. Rept. no. 6, 1 Oct 57-1 Jan 58, on Contract DA 36-039-sc-72717. [1958] 14p. 6 refs. AD-153 870.
Order from LC mi$2.40, ph$3.30 PB 138 769

Sample envelopes for 10- and 21-in. electrostatic deflection and focus direct view storage tubes were evaluated. Beam current and spot size studies were made of several writing guns, and the direct view storage tube test set was redesigned to provide 600-line resolution at TV scanning rates. The erasure gun design was evaluated and the junction by glass fritting of the panel to the funnel was explored. A study of means to prevent serious oxidation of screens during frit curing was initiated. (See also PB 132 758)

DuMont, Allen B., Labs., Inc., Clifton, N. J.
INDUSTRIAL PREPAREDNESS STUDY FOR DIRECT VIEWING STORAGE TUBES, by M. P. Wilder. Rept. no. 7, 1 Jan-31 Mar 58, on Contract DA 36-039-sc-72717. [1958] 22p. 14 refs.
Order from LC mi$2.70, ph$4.80 PB 138 767

Freedom from oxidation of tube parts during processing was accomplished by employing a "Quasi Optical" seal at the interface of the panel and funnel edges in association with 186PK Corning frit on the exterior portions. Stable high vacuum was obtained. (See also PB 138 769)

DuMont, Allen B., Labs., Inc., Clifton, N. J.
INDUSTRIAL PREPAREDNESS STUDY FOR DIRECT VIEWING STORAGE TUBES, by M. P. Wilder. Rept. for 1 Apr-1 May 58 on Contract DA 36-039-sc-72717. [1958] 10p. 1 ref.
Order from LC mi$1.80, ph$1.80 PB 138 768

See PB 138 767.

George Washington U., Washington, D. C.
ON AN INDUSTRIAL PROGRAMMING PROBLEM OF KANTOROVICH, by J. R. Isbell and W. H. Marlow. Rept. on Logistics Research Proj. Contract Nonr-761(05). 1 Oct 58, 12p. 10 refs. Serial T-92/58; AD-203 832.
Order from LC mi$2.40, ph$3.30 PB 143 037

This paper is a presentation of a maximization problem treated by L. V. Kantorovich. The problem concerns a linear model for industrial production, but the objective is to maximize a non-linear function of the output. Specifically, a certain composition or package of final products is ordered, and the size of this output of predetermined composition is to be as large as possible.

[Harvey Aluminum Sales, Inc., Torrance, Calif].
EXTRUSION OF NEW TITANIUM ALLOYS, by R. B. Simonson. Summary rept. for Sep 54-Oct 57 on Contract AF 33(600)28322. Nov 57, 152p. AD-152 797.
Order from LC mi$7.50, ph$24.30 PB 143 119

Contents:
Titanium extrusion techniques
Pilot production of titanium extrusions
Metallurgical evaluation
Mechanical properties of extruded Ti7Al-3Mo, 6Al-4V and 5Al-2.5Sn
Titanium scrap recovery
Chemical milling of titanium
Titanium forging
Cold drawing of titanium

Navy Electronics Lab., San Diego, Calif.
TESTS OF SOLDERED CONNECTIONS WITHOUT MECHANICAL JOINTS, by T. H. Hamm. 6 Mar 57, 12p. NEL research and development rept. 755; AD-138 058.
Order from LC mi$2.40, ph$3.30 PB 138 850

Heat cycling, shock, and vibration tests show that no mechanical or other advantage is gained by wrapping a wire lead around a terminal post or lug before soldering. Solder strength alone may be relied on to hold small capacitors and resistors by their pigtails; vibrating the parts at their resonant frequencies invariably causes the pigtails to break before trouble is experienced with the solder joints. Simple, unwrapped wire solder joints offer advantages of greater reliability; major savings in time and money; easier, faster inspection; and easier, faster maintenance (parts replacement). Simple, unwrapped wire solder joints will withstand far more severe operating conditions than those required by specification tests or service use.

Princeton U., N. J.
ECONOMETRIC ANALYSIS OF THE UNITED STATES MANGANESE PROBLEM. Technical rept. no. 3 (Final rept. pt. 1) on Contract Nonr-1858(02). 15 Oct 58, 70p. 3 refs. Econometric Research Program research memo. no. 3.
Order from LC mi$3.90, ph$10.80 PB 143 225

Rodman Lab., Watertown Arsenal, Mass.
EMPLOYMENT OF PLASTIC TOOLING IN METAL FORMING APPLICATIONS, by A. M. Ayvazian. Jan 59, 29p. 9 refs. Technical rept. no. RPL-31/7.
Order from LC mi$2.70, ph$4.80 PB 138 699

Utilizing an epoxy metal filled resin, investigations were conducted in the form of physical tests and actual industrial applications in order to evaluate the use of this material as plastic tooling. Physical tests were performed to study the mixing and pouring procedure and also to examine the dimensional stability of this resin. The plates and clamps fabricated with the plastic tooling were processed satisfactorily.

Springfield Armory, Mass.
RECLAMATION OF INDUSTRIAL DIAMONDS FROM DRESSING AND FORMING TOOLS, by K. A. Jorczak. 7-Apr 58, 11p. SA-TR20-7000.
Order from LC mi$2.40, ph$3.30 PB 138 758

An investigation was conducted to determine an efficient and economical procedure by which industrial diamonds can be reclaimed from dressing and forming tools. The wet chemical and the electrochemical methods of extracting diamonds from matrices of various alloys were investigated. Procedure is discussed, and results presented. A suggested procedure, based on extraction by electrochemical method, is given.

Stanford U., Calif.
DYNAMIC VERSION OF THE ECONOMIC LOT SIZE MODEL, by Harvey M. Wagner and Thomson M. Whitin. Technical rept. no. 48 on Contract N6onr-25133. 28 Feb 58, 12p. 5 refs.
Order from LC mi$2.40, ph$3.30 PB 139 312

By now the "square root formula" for an economic lot size under the assumption of a steady-state demand rate is well known. The calculation is predicated upon a balancing of the costs of holding inventory against the costs of placing an order. When the assumption of a steady-state demand rate is dropped - i.e., when the amounts demanded in each period are known but are different - and furthermore, when inventory costs vary from period to period, the square root formula (applied to the overall average demand and costs) no longer assures a minimum cost solution. We shall present a simple algorithm for solving the dynamic version of the model.

Army Engineer Waterways Experiment Station, Vicksburg, Miss.
DEFLECTION OF MOVING TIRES: A PILOT STUDY ON A 12 X 22.5 TUBELESS TIRE. July 59, 38p. Technical rept. no. 3-516, rept. 1.
Order from LC mi$3.00, ph$6.30 PB 143 058

A pilot study of the deflection characteristics of a moving 12x22.5 tubeless tire shows the shape of the tire to be governed by the inflation pressure as well as the consistency or strength of the medium on which it operates. Results of the pilot study indicate that a comprehensive test program should be worthwhile.

[Army] Transportation Research and [Engineering] Command, Fort Eustis, Va.
A DESIGN GUIDE FOR THE APPLICATION OF PNEUMATIC TIRES TO VEHICLES INTENDED FOR OFF-ROAD SERVICE (A Review and Condensation), by Richard C. Kerr. Nov 56, 50p. Original pub. 3 Jan 55.
Order from LC mi$3.30, ph$7.80 PB 139 001

Military agencies have studied the effect of reduced pneumatic-tire inflation and various tire sizes and combinations on the adverse-terrain mobility of military vehicles. Their investigations and tests show conclusively that the off-road performance of standard U. S. Army wheeled vehicles can be greatly improved by installing oversize off-road type of tires and operating them at reduced inflation pressures. A series of schedules is needed for long-distance, cross-country, and off-road transport operations at various speeds.

Mansfield Tire and Rubber Co., Ohio.
BUTYL TRUCK TIRE DEVELOPMENT. Final rept. on Contract DA 20-089-ORD-37186. 28 June 57, 20p. AD-143 296.
Order from LC mi$2.40, ph$3.30 PB 138 664

A truck tire was satisfactorily fabricated of butyl synthetic rubber. The tires were tested to determine conformance to Ordnance standards. Tires, 9.00-20-8 PR-NDCC, (carcass ply butyl modified with p-nitrosophenol) met the requirements of MIL-T-12459 and compared favorably with regular military control tires in a 20,000-mi road test. Tires which were made from another run of 20 units containing improved butyl modified with Elastopar also met the requirements. The Esso research and engineering laboratories developed a new butyl latex which, combined with resorcinol-formaldehyde, produced a satisfactory bonding treatment for rayon. With Monsanto Chemical Co., the Esso laboratories developed Elastopar, a new modifier. Factory processes and methods of handling for natural rubber-GR-S tires applied equally well to butyl. Butyl tires when new showed low adhesion which increased after wheel testing.

Massachusetts Inst. of Tech., Cambridge.
TRANSPORTATION-TYPE PROBLEMS: THEORETICAL FOUNDATION AND COMPUTATIONAL ASPECTS OF THE SIMPLEX METHOD OF SOLUTION, by Michel A. Simonnard. Master's thesis. Interim technical rept. no. 11 on Fundamental Investigations in Methods of Operations Research, Contract DA 19-020-ORD-2684. Jan 59, 90p. 32 refs. AD-211 355.
Order from LC mi$4.80, ph$13.80 PB 143 054

This report presents a discussion of a class of linear programming problems which are very simple extensions of the classical Hitchcock-Koopmans transportation problem, and which include the latter as an important special case. Only the simplex method of solution of linear programming problems has been considered. A number of points which are particular to the classical "transportation problem" are derived from the very simple nature of the matrix of the coefficients in the constraints. This theoretical foundation allows a justification of the well-known "stepping-stone" algorithm. All the results are then extended to the general problems. The author's contribution has been (i) to develop a few new theorems and proofs, (ii) to connect a number of known results together in order to present, for the first time in the literature, a complete theoretical and computational treatment of the specialized form of the simplex method used in the transportation problem, (iii) to extend this result to a more general class of problems where the equality constraints are replaced by inequalities and where the costs are unrestricted.

Naval Research Lab., Washington, D. C.
AN ANALYSIS OF THE AVOIDANCE OF COLLISION BETWEEN AIRCRAFT ON CURVILINEAR FLIGHT TRAJECTORIES, by P. A. Crafton. 10 Aug 59, 17p. NRL rept. 5344.
Order from OTS $0.50 PB 151 769

The problem of the avoidance of collision of aircraft has been analyzed for the general case in which the flight trajectories of the aircraft are curvilinear and three-dimensional, and in which the number of aircraft is greater than two. Mathematical relationships have been derived which govern the prediction of collision and the consequent avoidance of collision. The deviation of a collision flight path into an avoidance flight path is effected only after it has been verified that the proposed avoidance trajectory is itself not a collision trajectory with any other aircraft and that the proposed avoidance trajectory is indeed within the performance capabilities of the avoiding aircraft. Consideration is given to the saving of fuel by requiring that the avoidance trajectory not deviate more than is necessary from the original flight path.

Office of Scientific Research and Development. Div. 12.
TRANSPORTATION EQUIPMENT AND RELATED PROBLEMS, VOL. I. Summary technical rept. on Contract OEMsr-1131. 1946, declassified 17 July 58, 375p. 389 refs. AD-200 798.
Order from LC mi$11.10, ph$57.60 PB 143 344

The development of transportation equipment for combat use, especially amphibious assault, is discussed. The contents include the following: amphibious jeep (1/4-ton, 4x4 amphibian truck); development and applications of the DUKW (General Motor Corp. 2 1/2-ton, 6x6 amphibian truck); the Weasel (light, track-laying cargo carrier originally developed as a snow vehicle for winter invasion); amphibious gun motor carriage; paddy vehicle (light, amphibious cargo carrier with a low unit ground pressure for use in rice paddies, etc.); proposed amphibious vehicles including the Pelican; amphibious devices and studies; ponton bridge reactions; bridge, ponton, and ferry designs; tests of bridge components; torpedo protection for merchant vessels; land combat vehicles, and land vehicle components and studies. The following special devices were developed: improved aircraft brakes for heavy bombers, 2 new bomb rack designs, a new type of thread gage, substitutes for pneumatic automobile tires, a 7-man life raft, rain-repellant coatings, anti-fogging compounds incorporating wetting agents, and sine-disk propellers. Special studies included investigation of the principal hull factors affecting ship turning, correlation of performance of different vehicles on various types of snow, attempts to reduce the visibility of the wakes of small amphibious vessels, and wind and wave studies. A special project was the design of a 10-ton bomb (the Egg) for use against fleet units at anchor and to breach dams.

Stanford U. Graduate School of Business, Calif.
A NEW CONCEPT OF TRANSPORTATION MOVEMENT, by Gayton E. Germane, Joseph O. Carter, and William E. Rogers. Rept. on Contract DA 44-177-TC-384. Mar 59, 359p. Proj. 9-97-40-000; AD-209 920.
Order from LC mi$11.10, ph$54.60 PB 142 856

A system has been developed for planning and scheduling movement of cargo in the Communications Zone of an overseas theater. Known as TIPS, for Transportation Integrated Processing System, it was designed to take advantage of new developments in the field of automatic data processing and data transmission.

MATERIALS

Army Chemical Warfare Labs., Army Chemical Center, Md.
FIFTH MATERIALS REVIEW, by Arthur Lyem. Rept. for 16 July 58-5 Jan 59. 17 Feb 59, 89p. 279 refs. CWL Special Pub. 4-9.
Order from OTS $2.25 PB 161 014

The purpose of this periodic review is to present information on important technical and scientific highlights regarding materials research here and abroad, principally in the polymer and plastics field. The information recorded herein is intended to serve as a timely and convenient reference for development personnel seeking information relative to engineering materials of actual or potential interest in creating more efficient or economical end items. Thus, technical literature surveys culminating in the "Materials Review" will promote dissemination of selected information concerning recent world-wide technological advancements which may help to guide future exploitations of synthetics and other new materials and techniques. (See also PB 139 535)

Army Engineer Waterways Experiment Station, Vicksburg, Miss.
PREFABRICATED AIRFIELD AND ROAD SURFACING MEMBRANES: TEMPERATE ZONE STORAGEABILITY TESTS, 1953-1956. July 59, 29p. Technical rept. no. 3-515, rept. no. 1.
Order from LC mi$2.70, ph$4.80 PB 142 942

Laboratory and field storageability tests were conducted on six coated fabrics to determine their capabilities for storage in the Temperate Zone for a 3-yr period. In the laboratory, tensile strengths and elongation properties of the membranes were determined before and after the storage period. In the field, rolls of membranes were placed in racks and exposed to the weather. The materials were inspected periodically, and climatic data were recorded throughout the storage period. Results were as follows: (a) cotton fabrics coated with a minimum of 8 oz per sq yd of neoprene or nonmigrating vinyl plastic on each side withstood three years of open storage satisfactorily; (b) vinyl coatings incorporating migrating plasticizers were unsuitable for prolonged open storage; (c) cardboard cores were not suitable for prolonged open storage; and (d) membranes treated with dry-back reclaimed rubber adhesive were not satisfactory for open storage.

Goodrich, B. F., Co., Brecksville, Ohio.
DEVELOPMENT OF INORGANIC POLYMER SYSTEMS, by Carlin F. Gibbs, Harold Tucker and others. Rept. for Dec 54-Nov 55 on Rubber, Plastic and Composite Materials, Contract AF 33(616)2744. May 56, 61p. 62 refs. WADC Technical rept. 55-453.
Order from OTS $1.75 PB 131 935

Following an initial investigation of modification of phosphonitrile chloride, which was then deemphasized to avoid contractual conflicts, a study of semi-inorganic polymers based upon an aluminum-oxygen-silicon system was begun. The basic reasons for studying such a system were founded upon the known thermal stability of aluminum silicates found in nature. The most stable difunctional aluminum monomers found were quadricovalent chelates such as mono (1, 3-diphenyl-1, 3-propanediono) aluminum diisopropoxide which melted at 324°C, without decomposition. Reaction of the difunctional aluminum monomers with difunctional silicon monomers has not yet resulted in high molecular weight materials.

Midwest Research Inst. [Kansas City, Mo.]
HEAT CAPACITY DETERMINATION OF MINERAL AND SYNTHETIC ENGINE OILS, LUBRICANTS, FUELS AND HYDRAULIC FLUIDS IN THE TEMPERATURE RANGE 70°-500° F, by T. M. Medved, C. C. Bolze and others. Rept. for Mar 58-Jan 59 on Materials Analyses and Evaluation Techniques, Contract AF 33(616)5269. June 59, 64p. 1 ref. WADC Technical rept. 59-166.
Order from OTS $1.75 PB 161 030

The heat capacities of 33 mineral and synthetic engine oils, lubricants, fuels, and hydraulic fluids were measured over a temperature range of 80° to 500°F. Calorimeter constants were obtained by internal standardization foregoing the use of a standard liquid. The calculated errors in the final results were 3 to 5 per cent. A comparison of latent heats of vaporization of phenyl ether samples is included.

Quantum, Inc. [Mt. Carmel, Conn.]
RESEARCH ON ELEVATED TEMPERATURE RESISTANT INORGANIC POLYMER STRUCTURAL ADHESIVES, by Harold H. Levine. Rept. for July 54-July 55 on Rubber, Plastic and Composite Materials, Contract AF 33(616)2555. Mar 56, 57p. 90 refs. WADC Technical rept. 55-271.
Order from OTS $1.50 PB 131 934

Attempts to prepare inorganic metal-to-metal adhesives stable at 1000°F are described. Six promising products resulted from the following reactions: (1) melamine-phosphorus pentachloride (2) melamine-phosphorus oxychloride (3) melamine-phosphorus pentoxide (4) ammeline-phosphorus pentachloride (5) cyanuric trihydrazide-phosphorus pentachloride (6) carbohydrazide-phosphorus pentachloride. These products are stable from 750°F to red heat, are generally insoluble, and they possess very reactive atoms which may be capable of modifications resulting in adhesive properties. Attempts to incorporate metal atoms into an adhesive precursor were successful with titanium. Epoxy resins can be cured, without external heat, by use of phosphorus pentoxide.

Textile Research Inst., Princeton, N. J.
RESILIENCE OF FIBERS, by J. H. Dusenbury, A. B. Coe and others. Annual summary rept. for 1957 on Contracts Nonr-09000 and 09001. 25 Mar 58, 19p. 8 refs.
Order from LC mi$2.40, ph$3.30 PB 139 298

This Annual Summary Report is submitted to provide a review of the research that has been carried out. The conclusions given herein, some of which are based on work still in progress, may be revised in forthcoming technical reports.

Ceramics and Refractories

Chicago Midway Labs., U. of Chicago, Ill.
DETERMINATION OF FACTORS GOVERNING SELECTION AND APPLICATION OF MATERIALS FOR ABLATION COOLING OF HYPERVELOCITY VEHICLES, by John H. Bonin, Channon F. Price and Donald E. Taylor. Rept. on Materials Analysis and Evaluation Techniques, Contract AF 33(616)5436. July 59, 41p. WADC Technical rept. 59-87, pt. 2.
Order from OTS $1.25 PB 161 049

The results obtained from tests of samples of twenty-two different materials are presented. The samples were exposed to the high-temperature plasma discharge produced in an air-stabilized electric arc. The sample shape, test conditions and test procedure, and the material behavior are reported upon.

New Jersey Ceramic Research Station, Rutgers State U., New Brunswick.
IMPROVED CERAMICS, by E. J. Smoke, J. P. Callahan and others. Progress rept. no. 11, 1 June-1 Sep 57, on Contract DA 36-039-sc-64566. [1957] 76p. 2 refs.
Order from LC mi$4.50, ph$12.30 PB 138 939

To understand the mechanism involved in ultra low loss in ceramics at very high frequencies, high quartz bodies fluxed with boron phosphate, barium fluoride and magnesium silicate (talc) are being evaluated. The wollastonite-clay-lead bisilicate system was evaluated, for impact strength, modulus of elasticity and transverse strength. Seven alumina-glass compositions containing from 85 to 55% alumina and from 15 to 45% glass were investigated. A wollastonite-lead aluminosilicate body, which exhibits a firing shrinkage of -1.31% was fabricated by the dry pressing technique. Over a limited portion of the pressure range evaluated, two bodies exhibit true zero firing shrinkage.

Northrop Aircraft, Inc., Hawthorne, Calif.
STABILITY OF BERYLLIUM OXIDE IN HYDROGEN AT ELEVATED TEMPERATURES, by L. A. Ohlinger. Rept. on Stability of Refractory Elements and Compounds in a Hydrogen Atmosphere at Elevated Temperatures. 26 May 48, 17p. 6 refs. NEPA 598-NOR-36; Rept. no. NRR-143; AD-145 605.
Order from LC mi$2.40, ph$3.30 PB 143 041

St. Louis U., Mo.
STRUCTURE OF VITREOUS SILICA BY TOTAL NEUTRON SCATTERING, by R. M. Delaney and A. H. Weber. Final technical rept. pt. 2, on Neutron Diffraction Study of the Structure of Glasses, Contracts DA 23-072-ORD-(-473, -593). 15 Nov 58, 38p. 10 refs.
Order from LC mi$3.00, ph$6.30 PB 142 916

The total thermal neutron scattering cross section is measured as a function of neutron wavelength employing the slow neutron velocity selector in conjunction with the thermal neutron column of the Argonne National Laboratory research reactor. The inelastic scattering cross section is obtained by two methods one of which is semi-empirical and the other theoretical employing an Einstein single phonon model for the liquid-like scatterer.

Fuels, Lubricants, and Hydraulic Fluids

Aberdeen Proving Ground, Md.
A STUDY OF FUEL PUMP DIAPHRAGM DECOMPOSITION. SCREENING TESTS TO DETERMINE EFFECT OF MATERIALS AND COATINGS ON GASOLINE STABILITY AND GUM CONTENT, by C. B. Jordan and C. F. Pickett. Rept. no. 12 on

Ordnance Proj. no. TB5-0010C. 28 Mar 56, 17p. 3 refs. Engineering Labs. rept. no. 36.
Order from LC mi$2.40, ph$3.30 PB 139 017

A laboratory test was developed which was used as a means of measuring the effect of different factors influencing the breakdown of fuel pump diaphragms. Comparative tests were run using different gasoline, measured amounts of air, weighed amounts of different additives and different controlled temperatures.

Aeroprojects, Inc., West Chester, Pa.
ULTRASONIC FUEL FOAM CONTROL. Rept. on Contract AF 33(038)22522. May 53, 44p. 1 ref. Research rept. no. 53-37.
Order from LC mi$3.30, ph$7.80 PB 143 315

An air-driven, resonant-cavity type of ultrasonic generator for suppressing fuel foaming in jet aircraft fuel during rapid climb to altitude was designed and tested. Air pressure to the device is controlled by means of a specially designed altitude-sensitive pressure regulator operating from the aircraft's primary jet turbine. Free air consumption is less than 5 cubic feet per minute under sea level conditions. The device proved effective in suppressing fuel foaming from sea level to a simulated altitude of 40,000 feet.

Armour Research Foundation, Chicago, Ill.
DEVELOPMENT OF QUALIFICATION TEST METHODS FOR GEAR LUBRICANTS, by D. L. Powell. Summary rept. for Nov 57-Oct 58 on Contract DA 11-022-ORD-905. [1958] 49p. 2 refs.
Order from LC mi$3.30, ph$7.80 PB 142 801

An experimental and analytical study has been undertaken to determine the lubrication environment of automotive hypoid gears under severe dynamic operating conditions. (See also PB 119 543)

Battelle Memorial Inst., Columbus, Ohio.
THE DEVELOPMENT OF OSCILLATORY PLAIN BEARINGS AND LUBRICANTS FOR AIRFRAME APPLICATIONS IN THE TEMPERATURE RANGE -90 F TO 1500 F, by W. A. Glaeser, C. M. Allen and others. Rept. for 1 Feb 56-31 Jan 58 on Contract AF 33(600)31992. Apr 59, 62p. 1 ref. WADC Technical rept. 59-179; AD-216 629.
Order from OTS $1.75 PB 161 051

Materials and lubricants for high temperature airframe journal type bearings have been developed and evaluated under simulated operating conditions. The temperature range investigated was -90 F to 1500 F. Bearing operation was oscillatory at about 15 cycles per minute. Promising shaft and bushing materials were found for temperatures up to 1500 F. A high temperature lubricant was developed which showed promise in the 800 F to 1200 F range at bearing loads up to 25,000 psi.

Burke Research Co., Van Dyke, Mich.
RESEARCH ON VINYLIC FILLER LUBRICANTS AND GREASES, by U. F. Nager and M. T. Johnston. Technical rept. no. 16T, 1 July-30 Sep 57, on Contract Nonr-2146(00). [1957] 8p. 2 refs. AD-144 253.
Order from LC mi$1.80, ph$1.80 PB 138 884

The preparation of telomer intermediates from perfluoropropyliodide (C_3F_7I), perfluoropropylene (C_3F_6), and 1, 1-difluoroethylene (I) was completed. These intermediates are to be used in the preparation of fluorinated oils 1, 2, and 3. Oil 1 consists of 1 mole 2-iodoperfluorohexane and 5.5 moles, I doubled by coupling with Hg; its boiling point is to be 180° to 260°C at about 0.1 mm Hg. Oil 2 is a perfluorocarbon chloride derived from telomerization of C_3F_7I and C_3F_6, followed by chlorination (bp=150° to 170°C at less than 0.1 mm Hg). Oil 3 (bp=135° to 227°C at about 0.1 mm Hg) is prepared by reacting 2-iodoperfluorobutane with vinylidene fluoride; the product is coupled with Hg. Oils 1 and 2, as well as lower and higher molecular-weight telomers as by-products, were prepared in autoclaves.

Burke Research Co., Warren, Mich.
RESEARCH ON VINYLIC FILLER LUBRICANTS AND GREASES, by U. F. Nager, P. Davis and M. T. Johnston. Technical rept. no. 22T, 1 Jan-31 Mar 58, on Contract Nonr-2146(00). [1958] 23p.
Order from LC mi$2.70, ph$4.80 PB 139 181

The primary aim of this study is to develop new lubricating greases which will stand up under shear at temperatures up to 300°C. (preferably above 500°C.) to which they may be subjected under operating conditions. The scope has been broadened to include (1) the preparation of new fluorinated liquid polymers (by telomerization and contact catalysis) and (2) the investigation of greases prepared therefrom by combining with vinylic fillers. A further object of this study is to develop new methods for preparing fluorocarbon dinitriles for use in ONR research work directed elsewhere toward producing fluorocarbon elastomers.

Fuels Research Lab., Mass. Inst. of Tech., Cambridge.
MODELING STUDIES OF SUB-ATMOSPHERIC COMBUSTORS, by W. P. Jensen, P. M Raymond, and A. C. Tobey. Rept. for 1 June 55-31 May 58 on Simulated High Altitude Combustion Research, Contract AF 33(616)3037. Dec 58, 48p. 26 refs. WADC Technical rept. 58-620; AD-208 857.
Order from OTS $1.25 PB 151 723

An experimental study has been conducted to determine the model laws which govern scale-up of high output combustion systems. Of three systems chosen, major effort was devoted to study of a geometrically similar family of ramjet-type burners, of 1.6-, 3-, 4-, and 6-inch diameter. Controlled variables were inlet velocity and temperature, fuel/air ratio, and ambient pressure. As a criterion of similarity, the combustion efficiency (based on oxygen consumption) was measured at the discharge of a tailpipe 5.25 burner diameters downstream of a flat-cross flameholder; as a secondary similarity criterion burner stability limits were also determined. Two other systems also studied from the modeling point of view were diffusion flames of propane jets and non-burning heated-air jets mixing with ambient air, and the variables in each case were ambient pressure, jet diameter and jet velocity.

Instituto Nacional de Tecnica Aeronautica Esteban Terradas [(Spain)]
COMBUSTION OF FUEL SPRAYS, by G. Millan, I. Da Riva and S. Sanz. Rept. on Contract AF 61(514)997. 31 Jan 59, 29p. 7 refs. AFOSR-TN-59-629; AD-217 814.
Order from LC mi$2.70, ph$4.80 PB 143 170

The method proposed by Probert for the study of the evaporation of sprays is applied to the analysis of the combustion of a fuel spray burning in an oxidizing atmosphere. Some general conclusions of a qualitative nature are obtained regarding the most suitable characteristics of a spray. The great influence that the distribution function and the medium size of the droplets have on the processes under consideration, is also shown. The lack of experimental data constitutes an improtant difficulty in judging the validity of the model considered.

Propulsion Lab., Wright Air Development Center, Wright-Patterson AFB, Ohio.
THE EFFECT OF CARBON DIOXIDE BLANKETING ON JP FUELS, by T. L. Gossage. Nov 58, 11p. WADC Technical note 58-375.
Order from LC mi$2.40, ph$3.30 PB 142 868

A discussion of the conditions effecting solubility and evolution of carbon dioxide are contained herein as well as the application of blanketed fuel to aircraft fuel systems. Data are presented on field samples blanketed with carbon dioxide, laboratory samples and performance in altitude tank test equipment.

Rock Island Arsenal Lab., Ill.
SODIUM STEARATE ADSORPTION BY PHOSPHATED STEEL, by Arthur W. Andresen. 3 Feb 58, 14p. 8 refs. Rept. no. 57-2840.
Order from LC mi$2.40, ph$3.30 PB 142 691

The amounts of sodium stearate adsorbed on bare steel, grit blasted steel, room temperature formed and conventional zinc phosphate coatings on steel were determined. The amount of adsorption on the bare and grit blasted steel was considerably less than that on either type of phosphate coating.

Rock Island Arsenal Lab., Ill.
A STUDY OF SOME FACTORS AFFECTING OIL SEPARATION IN GREASES, by S. Fred Calhoun. 25 July 57, 59p. 26 refs. Technical rept. no. 57-1894; AD-144 769.
Order from OTS $1.50 PB 161 027

This report covers the results of a general study of the effect of various physical and chemical factors upon the oil separation (bleeding) tendencies of greases. Where possible the results were examined on a mathematical basis, but in many cases no exact relationship could be established. Bleeding was increased by an increase in temperature or pressure but not proportionally in all cases. Increasing the oil viscosity, soap percentage, additional millings, and aging of the grease, all tended to reduce bleeding. The chemical composition of the thickener and the consistency of the grease did not seem to have any consistent effect. The construction of the test cell had an influence in that a thicker grease layer reduced and a finer screen increased the bleeding. Radioactive tracer studies disclosed that during gravity bleeding of a grease the oil-soap ratio remained constant throughout the grease mass.

Plastics

Bjorksten Research Labs., Inc., Madison, Wis.
INVESTIGATION OF MYLAR-TYPE POLYESTER FILMS FOR PARACHUTE CANOPIES, by Johann Bjorksten, Risto P. Lappala and Robert J. Roth. Rept. on Textiles for High Speed Parachutes, Contract AF 33(616)403. Dec 53, 27p. WADC Technical rept. 53-298; AD-27 594.
Order from LC mi$2.70, ph$4.80 PB 139 011

The development is given of Mylar-type polyster film suitable for use as canopy material in personal type parachutes. The tear resistance of Mylar film was increased by sandwiching grids of Dacron thread between two sheets of Mylar. The reinforced films were subjected to the following tests: (1) burst and tensile strengths, (2) thickness, (3) weight, and (4) porosity. Load-elongation curves are given. Burst strength and tensile strength tests were performed on Mylar films with dacron multifilament reinforcement in accordance with specification CCC-T-191B, methods 5122 and 5102, respectively. Burst strength was 115 to 220 lb, and tensile strength was 45 to 90 lb. Weight per sq yd, determined in accordance with specification CCC-T-191B method 5041, was 2.00 to 4.42 oz. Maximum thickness, measured with a micrometer, was 0.003 to 0.0075 inch. In the center of each square of the reinforcing grid, holes were melted with a heated needle fastened to the tip of an electric soldering gun. Porosity was determined with a vacuum cleaner which blew air through a circular area 1.75 in. in diameter. For Ripstop Nylon the relative flow, measured with an air flow meter, was 650. For perforated reinforced Mylar the relative flow was 90. The burst strength of the Mylar was reduced approximately 10% by perforation. Two miniature parachutes, 29 and 56 in. in diameter, were fabricated and subjected to various tests. The results were excellent.

Brown U. Div. of Applied Mathematics, Providence, R. I.
ON ISOPERIMETRIC INEQUALITIES IN PLASTICITY, by Walter Schuman. Technical rept. no. 27 on Contract Nonr-562(10). Aug 57, 12p. 10 refs. C11-27; AD-140 269.
Order from LC mi$2.40, ph$3.30 PB 139 020

The purpose of this paper is the proof of the inequality $P \geq 6\pi M_0$, where P is the total limit load, M_0 the yield moment of a thin, perfectly plastic, simply supported, uniformly loaded plate of arbitrary shape and connection.

Brown U. Div. of Engineering, Providence, R. I.
ON MINIMUM WEIGHT DESIGN AND STRENGTH OF NON-HOMOGENEOUS PLASTIC BODIES, by D. C. Drucker. Technical rept. no. 6 on Contract

Nonr-562(20). Mar 58, 13p. 8 refs. Nonr-562(20)/6.
Order from LC mi$2.40, ph$3.30 PB 139 251

Previous results of Drucker and Shield are extended to bodies whose local strength is a function of position. A non-uniform distribution of temperature could conceivably produce such a variation in strength. Simple plane stress and plate bending examples illustrate the effect of inhomogeneity on the appropriate design. Also, limit loads and load-deformation relations for assemblages of materials are discussed. Quasi-homogeneous bodies, composed of a random distribution of several materials, are contrasted with bodies composed of regular arrays of uniform inclusions in a uniform but weaker matrix. Some conclusions of metallurgical interest are drawn.

Houze Glass Corp., Point Marion, Pa.
PARALLEL GLASS FIBERS AND REINFORCED PLASTIC LAMINATES, by Albert H. Lasday. Final rept. on Contract NOrd-16101. Oct 57, 56p.
AD-202 441.
Order from LC mi$3.60, ph$9.30 PB 143 343

This final report describes the development of a new type of glass fiber reinforced plastic laminate having greater strength than any other practical material and with a very low specific gravity. By the use of new parallel glass fiber spinning techniques, the enormous strength of glass fibers is utilized in a practical laminate. On a strength per unit weight basis, this is 18 times as strong as ordinary structural steel. Also noteworthy are the facts that this glass fiber plast c contains 25% by weight of resin or less, so that it is relatively inexpensive. The laboratory production process reported can be extended readily to large scale production of a tape that is well suited to fabrication by machine methods into end items such as tubing. An additional development herein reported is the successful experimental production of copper coated glass fibers by means of reduction at the fiber surface of some of the copper oxide constituent of the glass.

Massachusetts U., Amherst.
ON THE CONFIGURATION OF FLUOROCARBON-AMIDENE ELASTOMERS, by Richard S. Stein and Donald LeGrand. Technical rept. no. 7 on Contract Nonr-2151(00). 2 Oct 58, 20p. 5 refs.
Order from LC mi$2.40, ph$3.30 PB 143 228

Materials Lab., Wright Air Development Center, Wright-Patterson AFB, Ohio.
RADIATION INDUCED ULTRA-VIOLET ABSORPTION IN METHYL METHACRYLATE AS A METHOD OF DOSIMETRY, by D. R. Johnson. Rept. for Feb-May 59 on Materials Analysis and Evaluation Techniques. June 59, 13p. 2 refs. WADC Technical note 59-167.
Order from OTS $0.50 PB 161 034

This Note summarizes a series of experiments concerned with the development of an accurate method of dosimetry for measuring dosages encountered when radiation effects are carried out at high levels, i. e., 10^{10} - 10^{12} ergs gm^{-1} (C). The method utilizes the radiation induced ultraviolet absorption in methyl methacrylate for correlation with total dosages.

Naval Ordnance Lab., White Oak, Md.
THE USE OF ELECTRICAL RESISTIVITY IN THE STUDY OF THE POLYMERIZATION OF THERMO-SETTING RESINS, by R. H. Warfield and M. C. Petree. 22 May 58, 16p. 17 refs. NAVORD rept. 6120; AD-202 738.
Order from OTS $0.50 PB 161 028

Electrical resistivity has been used to follow the course of a series of bulk isothermal polymerizations of diallyl phthalate catalyzed with benzoyl peroxide. The time rate of change of the logarithm of the electrical resistivity was found to be temperature dependent. By taking the time rate of change of the logarithm of the resistivity as an index of the rate of polymerization the overall activation energy for the polymerization process was calculated to be 16 Kcal/mole. No change in slope was observed at the gelation points. The activation energy for the conduction process in the liquid unpolymerized resin was found to be 6 Kcal/mole and in the solid polymerized resin 26 Kcal/mole.

Rohm and Haas Co. [Philadelphia,] Pa.
THE INVESTIGATION OF MULTIAXIALLY STRETCHED ACRYLIC PLASTIC, by Julius J. Gouza and Dee A. Hurst. Rept. for 27 Feb 53-1 Dec 54 on Rubber, Plastic and Composite Materials, Contract AF 33(616)489. July 55, 121p. 4 refs. WADC Technical rept. 54-619, Pt. 1; AD-93 136.
Order from OTS $2.75 PB 131 933

The effects of stretching acrylic plastic sheet materials were determined so as to indicate the potential value of such procedures for producing transparent aircraft enclosures with properties equal to or better than laminated transparent plastic enclosures. Specifications MIL-R-8184, 6886A, and 5425A types of acrylic plastic sheet materials have been stretched by two different methods, biaxial and multiaxial, and aged under four different conditions. A biaxial stretching machine was designed and built. Initial material thickness was chosen so as to give a final thickness of approximately 0.25 inch after 0, 25, 50, 75, and 100 percent stretch at temperatures between 248° and 284°F as required for a particular material. There was no significant difference between the effects of biaxial and multiaxial stretching. Specification MIL-P-8184 type acrylic plastic stretched 75 percent equally in two directions possessed the best properties before and after aging. All stretched materials were better than unstretched in resistance to crazing, impact strength, and notch sensitivity but inferior in resistance to abrasion.

Wood and Paper

[Material Lab.] New York Naval Shipyard, Brooklyn.
PARAFINNING OF LIGNUM-VITAE. Final rept.

8 July 58, 6p. 3 refs. Lab. Project 6009.
Order from LC mi$1.80, ph$1.80 PB 142 953

It is felt that impregnation is superficial. Other information on storaging and shipping of lignum-vitae is also furnished.

Naval Civil Engineering Lab., Port Hueneme, Calif.
HARBOR SCREENING TESTS OF MARINE BORER INHIBITORS, I, by Harry Hochman and Thorndyke Roe, Jr. Interim rept. 9 July 59, 37p. 6 refs. Technical rept. 027; AD-209 527.
Order from LC mi$3.00, ph$6.30 PB 143 053

This report lists the results of harbor tests of treated panels exposed and removed between September 1955 and August 1958. It also lists all treated panels which have been exposed for one year or more and which have shown no attack or very slight amounts of attack. Heavy metal organic compounds when mixed with creosote, coal tar, or creosote-coal tar solutions are showing very good resistance to borer attack.

MATHEMATICS

Aarhus U. (Denmark).
ON THE DISTRIBUTION OF THE RANDOM VARIABLE H_n, by Erik Sparre Andersen. Technical scientific note no. 1 on Contract AF 61(052)42. 27 Feb 59, 18p. 4 refs. AFOSR-TN-59-671; AD-218 383.
Order from LC mi$2.40, ph$3.30 PB 143 166

In this note is treated the distribution of the random variable H_n. Given a sequence $X_1, X_2, \ldots$ of random variables we define $S_k = X_1 + \ldots X_k$ and the new sequence $T_0^{(n)}, T_1^{(n)}, \ldots, T_n^{(n)}$ as the largest convex minorant sequence to the sequence $S_0 = 0, S_1, \ldots, S_n$. The random variable H_n we define as the number of values $k (k = 1, \ldots, n)$ for which $T_k^{(n)} = S_k$. We shall assume that the random variables $X_1, X_2, \ldots$ are independent and identically distributed. In the case, where the common distribution function $F(x)$ of the random variables X_n is continuous the distribution of H_n is known. In this note we omit the condition that $F(x)$ be continuous. The main result is a formula for the double-generating function

$$H(s,t) = \sum_{n=0}^{\infty} \sum_{m=0}^{n} P(H_n = m) s^n t^m.$$

Aarhus U. (Denmark).
ON THE DISTRIBUTION OF THE RANDOM VARIABLE H_n, by Erik Sparre Andersen. Technical summary rept. [no. 1] on Contract AF 61(052)42. 27 Feb 59, 6p. 4 refs. AFOSR TN-59-672; AD-218 384.
Order from LC mi$1.80, ph$1.80 PB 143 165

Definition of the random variable H_n: Given a sequence of random variables $X_1, X_2, \ldots$ we define $S_k = X_1 + \ldots + X_k$ and a new sequence $T_0^{(n)}, T_1^{(n)}, \ldots, T_n^{(n)}$ as the largest convex minorant sequence to the sequence $S_0 = 0, S_1, \ldots, S_n$. The random variable H_n is defined as the number of values $k (k = 1, \ldots, n)$ for which $T_k^{(n)} = S_k$. The distribution of H_n has been investigated under the assumption that the random variables $X_1, X_2 \ldots$ are independent and identically distributed. If the common distribution function $F(x)$ of the random variables X_k is continuous, then the distribution of H_n is known. In the investigations reported the condition that $F(x)$ be continuous has been dropped. The main result is a formula for the double-generating function

$$H(s,t) = \sum_{n=0}^{\infty} \sum_{m=0}^{n} P(H_n = m) s^m t^m$$

Aeronautical Research Lab., Wright Air Development Center, Wright-Patterson AFB, Ohio.
THE PROBABILITY INTEGRALS OF THE RANGE AND OF THE STUDENTIZED RANGE: PROBABILITY INTEGRAL, PERCENTAGE POINTS, AND MOMENTS OF THE RANGE, by H. Leon Harter and Donald S. Clemm. Rept. on Transformations in the Analysis of Variance. Apr 59, 153p. 19 refs. WADC Technical rept. 58-484, vol. 1; AD-215 024.
Order from OTS $3.00 PB 161 037

A description is given of the computation and use of tables of the probability integral of the range, percentage points of the range, and moments of the range for samples from a normal distribution. The following tables are included: (1) an eight-decimal-place table of the probability integral of the (standardized) range, $W = w/\sigma$, at intervals of 0.01 for samples of size $n = 2 (1) 20 (2) 40 (10) 100$; (2) a six-decimal-place table of percentage points of the range for the same values of n and cumulative probability $P = .0001, .0005, .001, .005, .01, .025, .05, .1 (.1) .9, .95, .975, .99, .995, .999, .9995$ and $.9999$; and (3) a table of moments of the range [mean to 10 decimal places (11 significant figures), variance to 10 decimal places (10 significant figures), skewness to 8 decimal places (8 significant figures) and elongation (sometimes inappropriately called kurtosis) to 7 decimal places (8 significant figures)] for samples of size $n = 2 (1) 100$.

Air Force Cambridge Research Center, Bedford, Mass.
CALCULATION OF GAMMA FUNCTIONS TO HIGH ACCURACY WITH $\Gamma(1/3)$ AND $\Gamma(2/3)$ TO 35 DECIMAL PLACES, by M. E. Sherry. Sep 58, 8p. 8 refs. AFCRC-TN-58-385; AD-160 837.
Order from LC mi$1.80, ph$1.80 PB 138 775

Gamma functions of real argument can be evaluated to very high accuracy by means of a form of Stirling's series. Values of $\Gamma(1/3)$ and $\Gamma(2/3)$ and their logarithms to 35 significant digits are presented.

Air Force Cambridge Research Center, Bedford, Mass.
THE CORRELATION FUNCTION ON SETS OF FINITE REGULAR SEQUENCES IN PLUS AND MINUS ONE, by Eugene Prange. Oct 58, 12p. 5 refs. AFCRC-TN-58-551; AD-160 860.
Order from LC mi$2.40, ph$3.30 PB 138 732

Let B be a set of s distinct sequences of length n in

plus and minus one. Let $\bar{r}(B)$ be the maximum absolute value (unequal to n) of all integers occurring in the correlation functions on all pairs of (not necessarily distinct) sequences from B. For given n and s, it is desired to find some such set B with $\bar{r}$ minimal. Several ways of constructing sets of regular sequences of odd length n are given. The results of some computer experiments using these definitions are described. For example, the following triples (n, s, $\bar{r}$) are realized: (83, 2, 13), (83, 32, 26), (179, 2, 25), (179, 32, 40), (179, 128, 52).

Air Force Cambridge Research Center, Bedford, Mass.
SOME NOTES ON THE CORRELATION COEFFICIENT, by S. M. Silverman. May 59, 15p. 4 refs. GRD Research Notes no. 13; AFCRC TN-59-253; AD-216 105.
Order from OTS $0.50 PB 161 016

The basic properties of the simple correlation coefficient used in statistics are derived from the Cauchy inequality. The Cauchy inequality is then used to generalize the correlation coefficient so that it can be used for an arbitrary distribution. Some of the properties of this generalized correlation coefficient are then derived.

Air Force Cambridge Research Center, Bedford, Mass.
TABLES OF ANGULAR FUNCTIONS FOR MULTIPOLE EXPANSIONS OF ELECTROMAGNETIC FIELDS, by Nelson A. Logan, George E. Reynolds and Richard B. Mack. Apr 59 56p. 6 refs. AFCRC TR-59-132; AD-214 420.
Order from LC mi$3.60, ph$9.30 PB 142 963

Tables of the functions

$$\Pi_n(\cos\theta) = (-1)^n \frac{2n+1}{n(n+1)} \frac{P_n^1(\cos\theta)}{\sin\theta}$$

$$\tau_n(\cos\theta) = (-1)^n \frac{2n+1}{n(+1)} \frac{d}{d\theta} P_n^1(\cos\theta)$$

are presented for the range $\theta = 0^o(1^o)180^o$, $n = 1(1)50$. The computed values are correct to the five decimal places tabulated. The expansion of electromagnetic fields satisfying Maxwell's equations in spherical geometry is given in terms of $\Pi_n(\cos\theta)$ and $\tau_n(\cos\theta)$.

Air Force Cambridge Research Center, Bedford, Mass.
TABLE OF S(X) AND ITS FIRST ELEVEN DERIVATIVES, VOLUME I (VALUES 1 TO 5999), by Werner W. Gerbes, George E. Reynolds and others. Rept. on Contract AF 19(604)2045. Feb 58, 159p. 1 ref. AFCRC TR-58-117(I); AD-146 837.
Order from LC mi$7.50, ph$24.30 PB 138 902

Antenna design is somewhat simplified by introducing a special function S(x). Problems are more conveniently solved in terms of this new function and its derivatives. The new function, which resembles the sine integral in some respects, is

$$\int_0^x \left(\frac{\sin u/2}{u/2}\right)^2 du.$$

A table of 216,000 values of S(x) and its first 11 derivatives has been compiled to six-place accuracy for every circular degree over 50 cycles, that is, $x = 0^o(1^o)18,000$; 6D.

Applied Mathematics and Statistics Lab., Stanford U., Calif.
BAYES ACCEPTANCE SAMPLING PROCEDURES FOR LARGE LOTS, by D. Guthrie, Jr. and M. V. Johns, Jr. Technical rept. no. 37 on Contract N6onr-251(26). 1 May 58, 58p. 10 refs.
Order from LC mi$3.60, ph$9.30 PB 142 913

Non-Mathematical Summary: Suppose that a lot consisting of N items is presented for acceptance or rejection on the basis of a sample of size n. The usual method of attacking this problem is to choose some criterion (e.g., AQL or AOQL) and to select a plan meeting this specification from among those available in tabular form. These tabulated plans often use an arbitrary rule relating lot size with sample size. In actual practice cost considerations are often involved in a rather vague and subjective fashion in the choice of an AQL or AOQL and the relationship between lot size and sample size. The alternative approach proposed by this paper is to adopt an objective cost structure representing the consequences of accepting or rejecting a lot, and to base the choice of sample size and rejection number on these costs. At this stage we assume that each item is either defective or non-defective but we will consider more general cases later in the discussion.

Applied Mathematics and Statistics Lab., Stanford U., Calif.
CONNECTIONS ON CLOSED RIEMANN SURFACES, by N. S. Hawley. Technical rept. no. 72 on Contract Nonr-225(11). 7 Mar 58, 74p. 9 refs.
Order from LC mi$4.50, ph$12.30 PB 139 295

Applied Mathematics and Statistics Lab., Stanford U., Calif.
THE CYCLIC JACOBI METHOD FOR COMPUTING THE PRINCIPAL VALUES OF A COMPLEX MATRIX, by G. E. Forsythe and P. Henrici. Technical rept. no. 74 on Contract Nonr-225(11). 28 Mar 58, 42p. 13 refs.
Order from LC mi$3.30, ph$7.80 PB 139 271

Applied Mathematics and Statistics Lab., Stanford U., Calif.
HOMOMORPHISMS OF CERTAIN ALGEBRAS OF MEASURE, by Irving Glicksberg. Technical note no. 2 on Contract AF 49(638)294. 31 Dec 58, 28p. 8 refs. AFOSR-TN-58-1042; AD-206 572.
Order from LC mi$2.70, ph$4.80 PB 138 743

Ballistic Research Labs., Aberdeen Proving Ground, Md.
A STUDY OF REGULAR CONTINUED FRACTIONS, by R. Sherman Lehman. Feb 59, 50p. 20 refs. Rept. no. 1066.
Order from LC mi$3.30, ph$7.80 PB 143 143

This report presents results obtained in a numerical study of the regular continued fraction expansions of π and Euler's constant γ and also considers various mathematical questions suggested by this numerical study. The first 1986 partial quotients for π and the first 315 for γ were computed by ORDVAC. A statistical study was made comparing these expansions with known results from the metric theory of continued fractions. No significant departure from the behavior of almost all numbers was observed. In another study a theorem is proved which characterizes the numbers whose continued fraction expansions are given by primitive recursive functions.

California Inst. of Tech., Pasadena.
THE ASYMPTOTIC SOLUTION OF LINEAR SECOND ORDER DIFFERENTIAL EQUATIONS IN A DOMAIN CONTAINING A TURNING POINT AND REGULAR SINGULARITY [AND] THE ASYMPTOTIC EXPANSION OF LEGENDRE FUNCTIONS OF LARGE DEGREE AND ORDER, by R. C. Thorne, Technical repts. 12, 13 on Contract Nonr-220(11). 1956, 72p.
Order from LC mi$4.50, ph$12.30 PB 128 650

California U., Berkeley.
ON THE COHOMOLOGY OF THE REAL GRASSMAN MANIFOLDS AND THE CHARACTERISTIC CLASSES OF n-PLANE BUNDLES, by Emery Thomas. Technical rept. no. 6 on Contract AF 49(638)79. July 58, 68p. 8 refs. AFOSR TN-58-600; AD-162 125.
Order from LC mi$3.90, ph$10.80 PB 138 973

California U., Berkeley.
THE PARAMETRIC PROBLEM FOR DOUBLE INTEGRALS IN THE CALCULUS OF VARIATIONS, by Thomas C. Kipps. Technical rept. no. 23 on Contract Nonr-222(37). Feb 58, 24p. 14 refs.
Order from LC mi$2.70, ph$4.80 PB 139 316

California U., Berkeley.
A THEOREM OF FROBENIUS, A THEOREM OF AMITSUR-LEVITSKI AND COHOMOLOGY THEORY, by Bertram Kostant. Technical rept. no. 5 on Contract AF 49(638)79. July 58, 54p. 9 refs. AFOSR TN-58-585; AD-162 105.
Order from LC mi$3.60, ph$9.30 PB 138 957

California U., Berkeley.
UNIQUE CONTINUATION FOR ELLIPTIC EQUATIONS, by M. H. Protter. Technical rept. no. 7 on Contract AF 49(638)398. May 59, 20p. 14 refs. AFOSR-TN-59-476; AD-215 719.
Order from LC mi$2.40, ph$3.30 PB 142 843

A proof is given for a unique continuation theorem for linear second order elliptic equations. This is somewhat simpler than the previous proofs of Aronszajn, Cordes and Pedersen as no considerations of differential geometry are required. In addition the method of proof extends easily to higher order equations in which the highest derivative form is the iterated Laplacian.

Carnegie Inst. of Tech., Pittsburgh, Pa.
BOUNDS FOR THE EIGENVALUES OF SOME VIBRATING SYSTEMS, by Dallas Banks. Technical rept. no. 28 on Contract AF 49(638)227. June 59, 57p. 14 refs. AFOSR-TN-59-508; AD-216 273.
Order from LC mi$3.60, ph$9.30 PB 142 867

A sharp lower bound for the lowest eigenvalue of a rod with clamped ends is found when the density is given by a concave function. In the case of the monotone and convex density functions the form of the function which gives a sharp lower bound is obtained. Sharp lower bounds for the lowest eigenvalue of a membrane with fixed edges are found in the case of a bounded density function and in the case of a concave density function over a convex domain.

Chicago U., Ill.
CONDITIONS FOR AN ELLIPTIC SYSTEM OF LINEAR PARTIAL DIFFERENTIAL EQUATIONS TO BE EQUIVALENT TO A STRONGLY ELLIPTIC SYSTEM, by Lawrence M. Graves. Technical rept. no. 4 on Investigations in the Theory of Partial Differential Equations, Contract DA 11-022-ORD-1833. 1958, 12p. AD-137 089.
Order from LC mi$2.40, ph$3.30 PB 138 926

This note considers elliptic systems of two linear partial differential equations with real constant coefficients, and develops conditions for such a system to be transformable to a strongly elliptic system. Some of the conditions are applicable also in the case of variable coefficients.

Chicago U., Ill.
NEW TYPES OF NUMBER-THEORETICAL SYSTEMS, by A. Weil. Technical rept. on Contract AF 18(603)57. July 58, 15p. AFOSR TR-58-103; AD-162 245.
Order from LC mi$2.40, ph$3.30 PB 138 876

Chicago U., Ill.
TWO REMARKS ON FIBER HOMOTOPY TYPE, by Johy Milnor and Edwin Spanier. Technical note no. 2 on Research on Duality and Homotopy Theory, Contract AF 49(638)393. May 59, 11p. 11 refs. AFOSR-[TN]-59-545; AD-216 621.
Order from LC mi$2.40, ph$3.30 PB 142 844

Section 1 of this note considers the normal sphere bundle of a manifold M^n imbedded in euclidean space. It is shown that if the dimension of the euclidean space is sufficiently high then the normal sphere bundle has the fiber homotopy type of a product bundle if and only if there exists an S-map from S^n to M^n of degree one. The proof is based on the fact that the Thom space of the normal bundle is dual in the sense of Spanier-

Whitehead to the disjoint union of M^n and a point. Section 2 studies the tangent sphere bundle of a homotopy n-sphere. This has the fiber homotopy type of a product bundle if and only if n equals 1, 3 or 7. The proof is based on Adams work.

Colorado U., Boulder.
TWIN CONVERGENCE REGIONS FOR CONTINUED FRACTIONS $1+K(a_n/1)$; ONE OF WHICH IS THE CIRCULAR REGION $a_{2n-1} \leq \rho 2$, by W. J. Thron. Rept. on Contract AF 49(638)100. [1957] 61p. 8 refs. AFOSR TN-59-175.
Order from LC mi$3.90, ph$10.80 PB 139 228

In this paper a study is made of the continued fraction

$$1 + \frac{a_1}{1} \quad \frac{a_2}{+\ 1} \quad +\ \ldots,$$

whose elements a_n are complex numbers.

Hebrew U. (Israel).
CLASSES OF MINIMAL AND REPRESENTATIVE DOMAINS AND THEIR BERGMAN KERNEL FUNCTION, by Michael Maschler. Technical note no. 7 on Contract AF 61(052)04. May 58, 39p. 10 refs. AFOSR TN-58-673; AD-162 205.
Order from LC mi$3.00, ph$6.30 PB 138 984

The object of this paper is to discuss "minimal domains" and "representative domains" with respect to certain subclasses of analytic functions, and to deduce solutions to some extremal problems. In addition, differential equations are obtained for the kernel function, which are valid for various classes of domains.

Hebrew U. (Israel).
PROJECTION CONSTANTS, by B. Grünbaum. Technical note no. 6 on Contract AF 61(052)04. May 58, 33p. 10 refs. AFOSR TN-58-672; AD-162 204.
Order from LC mi$3.00, ph$6.30 PB 138 978

In the present paper we shall determine the projection constants for a number of concrete spaces, and obtain bounds for other spaces. Our investigations are in a certain sense dual to those of Murray, Sobczyk, and others, where for given concrete spaces bounds for projections onto subspaces were obtained.

Illinois Inst. of Tech., Chicago.
THE FINITE STURM-LIOUVILLE TRANSFORM, by A. Cemal Eringen. Technical rept. no. 4 on Contract N7onr-32909. 1 Aug 53, 21p. 6 refs. AD-17 504.
Order from LC mi$2.70, ph$4.80 PB 132 321

Special transforms whose intervals are finite are unified and extended. A kernel is employed which may be determined to suit each particular type of problem. The Sturm-Liouville expansion is obtained for f(x) when f(x) is an integral function over (a, b) and a $\mu x \nu b$. The finite Sturm-Liouville transform is defined. Solutions are obtained for some partial differential equations. Consideration is given to spherical harmonics; Hermite and Tchebycheff polynomials; and Bessel, Mathieu, and Wittaker functions. A heat conduction problem for which the solution was not known was successfully solved.

Indiana U. [Bloomington]
RESEARCH IN UNBIASED ESTIMATION, INTEGRAL EQUATIONS WITH UNKNOWN DISTRIBUTION FUNCTIONS, AND NON-PARAMETRIC METHODS, by Julius R. Blum. Interim technical rept. no. 9 on Contract DA 33-008-ORD-965. 16 Sep 58, 15p. 1 ref.
Order from LC mi$2.40, ph$3.30 PB 142 901

Conditions on the characteristic function of an infinitely divisible distribution are given which determine when that distribution is discrete, continuous, or a mixture. The results are applied to characterize the stochastic structure of a certain class of stochastic processes. The results obtained in this report have been accepted for publication in the Pacific Journal of Mathematics.

Institute for Fluid Dynamics and Applied Mathematics, U. of Maryland, College Park.
ON SOME GENERALIZED CAUCHY PROBLEMS AND THE CONVEXITY OF THEIR SOLUTIONS, by Robert Wayne Carroll. Rept. on Contract AF 49(638)228. Apr 59, 103p. 52 refs. Technical note BN-168; AFOSR-TN-59-649.
Order from LC mi$5.70, ph$16.80 PB 142 866

This paper treats a class of generalized Cauchy problems for equations of the type of the Euler-Poisson-Darboux (EPD) equation. In the case of the EPD equation Weinstein's [46] results about the convexity and growth of the solution are extended to the most general multiply subharmonic initial data and some of his criteria are sharpened. The conditions under which there will be a convexity theorem for equations of this type are examined. For the EPD equation of index n-1 a study is made of when the generalized solution is a solution in the usual sense.

Institute for Fluid Dynamics and Applied Mathematics, U. of Maryland, College Park.
ON UNIQUENESS THEOREMS FOR ORDINARY DIFFERENTIAL EQUATIONS AND FOR PARTIAL DIFFERENTIAL EQUATIONS OF HYPERBOLIC TYPE, by J. B. Diaz and W. L. Walter. Rept. on Contract AF 49(638)228. July 59, 18p, 7 refs. Technical note BN-177; AFOSR TN-59-740.
Order from LC mi$2.40, ph$3.30 PB 142 989

Uniqueness theorems for the ordinary differential equation $y' = f(x,y)$ and for the hyperbolic partial differential equation $u_{xy} = f(x,y,u,u_x,u_y)$ are proved by means of an elementary method, which is also applicable in more general situations, and involves only the ordinary Lagrange mean value theorem of the differential calculus and simple properties of continuous real valued functions.

Institute of Mathematical Sciences, New York U. N. Y.
THE DISCRIMINANT OF HILL'S EQUATION, by Wilhelm Magnus. Rept. on Contract AF 49(638)229. May 59, 43p. 4 refs. Research rept. no. BR-28; AFOSR-TN-59-576; AD-217 023.
Order from LC mi$3.30, ph$7.80 PB 143 176

Explicit expressions for the discriminant of Hill's equation up to terms of order four are being calcu-

lated. It is shown that these formulas permit a new proof of a theorem about the asymptotic distribution of the characteristic values. They also permit the derivation of certain summation formulas involving the lengths of the intervals of instability and the Fourier Coefficients of the periodic function appearing in Hill's equation.

Institute of Mathematical Sciences, New York U., N. Y.
NOTE ON ASSIGNMENT PROBLEMS, by Martin Kneser. Rept. on Contract Nonr-285(23). Dec 57, 7p. 3 refs. IMM-NYU 243.
Order from LC mi$1.80, ph$1.80 PB 139 394

Let $A = (a_{ik})$ be an n x n matrix with nonnegative elements. The problem of finding a permutation s of the numbers $1, 2, \ldots, n$ which minimizes the sum $A(s) = \sum_{i=1}^{n} a_{i,s(i)}$ is the mathematical content of the assignment problem. A method for the practical solution of this problem for large n was given by Flood and others. This method is considerably simpler than the (practically impossible) determination of all n! values A(s).

Institute of Statistics, North Carolina State Coll., Raleigh.
EXPERIMENTAL DESIGNS FOR INDUSTRIAL RESEARCH, by R. J. Hader. Final rept. for 1 Jan 53-30 June 58 on Contracts DA 36-034-ORD-1177 and DA 36-034-ORD-1517. [1958] 5p. 22 refs.
Order from LC mi$1.80, ph$1.80 PB 143 036

Institute of Statistics, U. of North Carolina, Chapel Hill.
INCOMPLETE BLOCK DESIGNS IN WHICH THE NUMBER OF REPLICATES IS NOT THE SAME FOR ALL TREATMENTS, by L. C. A. Corsten. Rept. on Contract AF 49(638)213. May 59, 20p. Mimeograph series no. 226; AFOSR TN-59-580; AD-217 027.
Order from LC mi$2.40, ph$3.30 PB 143 009

When designing experiments for comparison of the effects of treatments or varieties by means of an incomplete block arrangement, one often meets the difficulty that the usual requirement that every treatment occurs the same number of times, say r, cannot be satisfied. One has, e.g., only a very small quantity of seed of some (new) varieties available, while seed of other varieties is abundant. It is also possible that for some reason one has a minor interest in some of the varieties in comparison with the remaining varieties, and so does not wish to spend as many costs (replicates) on these varieties as on the more interesting ones.

Institute of Statistics, U. of North Carolina, Chapel Hill.
ON A CHARACTERIZATION OF THE TRIANGULAR ASSOCIATION SCHEME, by S. S. Shrikhande. Rept. on Contract AF 18(600)83. July 58, 17p. 3 refs. Mimeograph series no. 206; AFOSR TN-58-609; AD-162 137.
Order from LC mi$2.40, ph$3.30 PB 138 977

Institute of Statistics, U. of North Carolina, Chapel Hill.
A SIMPLE BAYES SOLUTION TO A COMMON MULTIPLE COMPARISONS PROBLEM, by David B. Duncan. Rept. on Contract AF 49(638)261. Apr 59, 38p. 23 refs. Mimeograph series no. 223; AFOSR TN-59-492; AD-215 845.
Order from LC mi$3.00, ph$6.30 PB 143 001

Institute of Statistics, U. of North Carolina, Chapel Hill.
THE UNIQUENESS OF THE L_2 ASSOCIATION SCHEME, by S. S. Shrikhande. Rept. on Contract AF 18(600)83. June 58, 26p. 9 refs. Mimeograph Series no. 204; AFOSR TN-58-608; AD-162 136.
Order from LC mi$2.70, ph$4.80 PB 138 971

The L_2 association scheme for a class of partially balanced incomplete block design determines the parameters of the second kind. This paper considers the converse problem whether or not these parameters imply the L_2 association scheme. Necessary conditions for the existence of such designs are also obtained.

Michigan U., Ann Arbor.
ACYCLIC CONTINUA IN THE PLANE AND QUASI-COMPLEXES, by James E. Keisler. Rept. on Contract AF 49(638)104. July 58, 16p. 2 refs. AFOSR TN-58-656; AD-162 187.
Order from LC mi$2.40, ph$3.30 PB 138 980

In this paper covering is used to mean finite open covering. An ε-covering of a metric space is a covering such that the diameter of each element of the covering is less than ε. For coverings A_1, A_2 such that A_1 refines A_2 ($A_1 > A_2$), $N(A_i)$ denotes the complex which is the nerve of the covering A_i and $\pi(1, 2)$ denotes one of the projection chain maps

$$\pi(1, 2): \; N(A_1) \to N(A_2)$$

induced by the inclusion map.

Michigan U., Ann Arbor.
ON THE THEOREMS OF GROSS AND IVERSEN, by A. J. Lohwater. Rept. on Contract AF 49(638)104. July 59, 18p. 22 refs. AFOSR TN-59-550; AD-216 660
Order from LC mi$2.40, ph$3.30 PB 143 006

This paper, a contribution to the theory of analytic functions, is concerned with the theory of cluster sets, where the topological properties of meromorphic functions are separated from the analytic properties. The principal results are generalizations of theorems of Gross and Iversen, asserting the inclusion of the frontier of the cluster set of a function f at P in the boundary cluster set of f at P. The generalization is obtained by the introduction of a refined boundary cluster set relative to a set of measure 0 on the unit circle. Every value of the cluster set minus the modified boundary cluster set is assumed infinitely often near P, with the exception of a set of logarithmic capacity 0. The results include a generalization of Picard's theorem to non-isolated essential singularities.

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
THREE-DIMENSIONAL PHASE-SPACE ANALYSIS, by Lawrence P. Grayson and . Mishkin. Rept. on Contract DA 30-069-ORD-1560. 12 May 59, 66p. 3 refs. Research rept. R-741-59; PIB-669; AD-217 317.
Order from LC mi$3.90, ph$10.80 PB 143 094

It is the purpose of this investigation to extend the geometrical properties of the singular points encountered in the study of second-order nonlinear control systems, in the phase-plane, to third-order systems, in a three dimensional phase-space. Single-valued nonlinear systems are analyzed by piecewise linearization techniques, i.e., the nonlinearities in the system are approximated by a series of straight line segments, so that the system is linear within certain regions. Phase-plane projections, as well as three dimensional sketches, of the trajectories corresponding to the different types of singular points encountered are given. Relationships are established between the pole positions, in the corresponding linear systems, and the singular points. The singular points developed are: a stable and an unstable center; a stable and an unstable node, a saddle point, a stable and an unstable focus, and a stable and an unstable degenerate focus.

Minnesota U., Minneapolis.
ON A SPECIAL INTEGRAL EQUATION, A LINEAR PARABOLIC DIFFERENTIAL SYSTEM, AND A WIENER INTEGRAL, by David A. Woodward. Technical note no. 5 on Stochastic Processes and Functional Analysis, Contract AF 18(603)30. Jan 58, 5p. 2 refs. AFOSR-TN-58-567; AD-158 386.
Order from LC mi$1.80, ph$1.80 PB 138 757

Missouri U., Columbia.
MATHEMATICAL MODELS FOR RANKING FROM PAIRED COMPARISONS, by H. D. Brunk. Technical rept. no. 11 on Contract AF 18(600)1108. Nov 58, 34p. 9 refs. AFOSR TN-58-1041; AD-206 573.
Order from LC mi$3.00, ph$6.30 PB 139 149

North Carolina U., Chapel Hill.
ON A NONLINEAR INTEGRAL, by Komarath Padmavally. Doctoral thesis. UNC rept. no. 8 on Contract AF 18(600)1139. Jan 58, 34p. 4 refs. AFOSR-TN-58-598; AD-162 123.
Order from LC mi$3.00, ph$6.30 PB 138 937

North Carolina U., Chapel Hill.
A POINCARÉ PROBLEM, by Komarath Padmavally. UNC rept. no. 9 on Contract AF 18(600)1139. July 58, 31p. 4 refs. AFOSR-TN-58-599; AD-162 124.
Order from LC mi$3.00, ph$6.30 PB 138 938

Polytechnic Inst. of Brooklyn, N. Y.
ON ASYMPTOTIC NUMERICAL METHODS FOR PARABOLIC EQUATIONS, by J. R. M. Radok. Rept. on Contract AF 49(638)302. Nov 58, 18p. 7 refs. PIBAL rept. no. 485; AFOSR TN-58-1072; AD-207 241.
Order from LC mi$2.40, ph$3.30 PB 139 151

Investigation of the roles played in the partial differential equations of physics by time and space derivatives leads to the conclusion that divided differences render suitable approximations to space derivatives, while the approximation of time derivatives may greatly benefit from more refined treatment. The formerly developed method of exponential extrapolation is applied to the diffusion equation for which explicit and implicit schemes are deduced. Based on certain assumptions, it is shown that the stability range for the explicit scheme becomes infinite as the steady state is approached. This result may lead to considerable savings of machine time in practical applications of the method.

Stanford U., Calif.
LINEAR GROWTH, BIRTH AND DEATH PROCESSES, by Samuel Karlin and James MacGregor. Technical rept. no. 3 on Contract Nonr-225(28). 31 Jan 58, 34p. 16 refs.
Order from LC mi$3.00, ph$6.30 PB 139 317

Syracuse U., N. Y.
ON SEMI-GROUPS OF POSITIVE MATRICES I, by W. B. Jurkat. Research rept. 20 on Contract AF 49(638)265. Sep 58, 14p. 10 refs. AFOSR TN-58-932; AD-205 097.
Order from LC mi$2.40, ph$3.30 PB 139 320

University Coll., Cork (Eire).
THE DIVERGENCE OF TRIGONOMETRIC SERIES, by P. B. Kennedy and Siobhan O'Shea. Technical note no. 3 on Contract AF 61(514)1399. [1958] 14p. 4 refs. AFOSR TN-58-634; AD-162 164.
Order from LC mi$2.40, ph$3.30 PB 138 975

A method due to Steinhaus, for the construction of everywhere-divergent trigonometric series with coefficients tending to zero, is generalised in a simple way. The generalisation leads to some information concerning a theorem due to Zygmund, on the power of the set of points of convergence of certain trigonometric series with gaps. The solution is given of a problem related to that considered by Steinhaus.

University Coll., Cork (Eire).
REMARKS ON CONTINUITY CONDITIONS, by P. B. Kennedy. Technical note no. 2 on Contract AF 61(514)1399. [1954] 6p. 2 refs. AFOSR TN-58-586; AD-162 107.
Order from LC mi$1.80, ph$1.80 PB 138 974

A remark made at the end of Technical Note No. 1 concerning Lipschitz conditions in intervals and sets of positive measure is now elaborated by different and rather simpler methods.

Utah U., Salt Lake City.
COMPLEX DIFFERENTIAL EQUATIONS, I. DISTRIBUTION OF ZEROS OF SOLUTIONS, by J. H. Barrett, W. J. Coles and others. Technical

rept. 1 on Contract DA 04-495-ORD-1088. Dec 58, 42p. 32 refs. AD-209 371.
Order from LC mi$3.30, ph$7.80 PB 143 088

The first section is concerned with Green's Function methods, inspired by the work of Nehari and Beesack, and contains extensions of known results as well as some new ones for both real and complex independent variables. The second section relates the methods of Beesack and Taam for obtaining comparison theorems for complex equations with their majorants. In the third section the polar form of the complex differential equation (with a real independent variable) is investigated, and extensions of previous work of two of the authors is obtained. The last section consists of a concise synopsis of circles of disconjugacy obtained by use of Wirtinger inequalities.

Washington U., Seattle.
HOLOMORPH-CONVEXITY IN BANACH SPACES (PART I). ON THE COMPLETENESS OF DOUBLY ORTHOGONAL SYSTEMS (PART II) by H. J. Bremermann. Technical rept. no. 2 on Contract Nonr-477(17). Aug 58, 16p. 4 refs.
Order from LC mi$2.40, ph$3.30 PB 142 817

Washington U., Seattle.
ON COMPLEX HOMOGENEOUS SPACES OF COMPACT LIE GROUPS, by Jun-ichi Hano. Technical rept no. 2 on Contract Nonr-477(15). 20 Mar 58, 34p. 9 refs.
Order from LC mi$3.00, ph$6.30 PB 139 371

The purpose of this note is to clarify the structure of complex homogeneous spaces of connected compact Lie groups. Especially, the structure of a compact complex homogeneous space with finite fundamental group is completely cleared up. As has been shown, when the fundamental group of a compact complex homogeneous space is finite, this space can be considered as a complex homogeneous space of a connected compact semi-simple Lie group.

Watertown Arsenal Labs., Mass.
SINGULARITIES IN THE PLANE THEORY OF ELASTICITY. PART 1, by Oscar L. Bowie. Mar 58, 45p. 2 refs. WAL Technical rept. 893/203.
Order from LC mi$3.30, ph$7.80 PB 139 329

Muskhelishvili's formulation of the plane problem in terms of a single analytic function is extended to regions defined by mapping. The solution of the class of regions defined by single-valued mapping functions is discussed in considerable detail for all practical load distributions.

Wayne State U., Detroit, Mich.
HOELDER CONTINUITY AND INITIAL VALUE PROBLEMS FOR MIXED TYPE EQUATIONS (I), by Y. W. Chen. Rept. on Contract AF 49(638)107. July 58, 34p. 11 refs. AFOSR-TN-58-607; AD-162 135.
Order from LC mi$3.00, ph$6.30 PB 138 756

Wayne State U., Detroit, Mich.
HOELDER CONTINUITY AND INITIAL VALUE PROBLEMS FOR MIXED TYPE EQUATIONS (II), by Y. W. Chen. Rept. on Contract AF 49(638)107. Aug 58, 21p. 11 refs. AFOSR-TN-58-698; AD-162 232.
Order from LC mi$2.70, ph$4.80 PB 138 754

See PB 138 756

Wayne State U., Detroit, Mich.
ON FIBERINGS WITH SINGULARITIES, by Sze-Tsen Hu. Rept. on Contract AF 49(638)179. Aug 58, 33p. 7 refs. AFOSR-TN-58-611; AD-162 139.
Order from LC mi$3.00, ph$6.30 PB 138 755

In the present paper, we shall first introduce a general definition of fiberings with singularities which includes all of the known fiberings as special cases. Then, by identifying the singular fibers to points, we shall prove that every fibering p with singularities can be decomposed into the composition $p_1 \circ p_2$ of two fiberings p_1 and p_2 where every singular fiber of p_1 is a singleton and every regular fiber of p_2 is a singleton. Furthermore, p_2 is the natural projection of some topological identification. Therefore, after that point, we shall be concerned only with fiberings whose singular fibers are singletons.

Western Reserve U., Cleveland, Ohio.
FITTING OF TABULATED DATA TO AN ANALYTIC FORM, by V. F. Walters and G. E. Tauber. Rept. on Contract AF 18(603)61. 31 July 59, 8p. 4 refs. AFOSR TN-59-736.
Order from LC mi$1.80, ph$1.80 PB 142 991

In this research, the aim has been to find an analytic function to fit a given set of tabulated values for K and L wave functions. It was desirable to find a minimum number of parameters which determine an analytic form that has approximately the same behavior as the original set of values.

Computing Devices

Burroughs Corp. [Philadelphia,] Pa.
FIXED PROGRAM STORAGE TECHNIQUES, by G. H. Barnes and A. E. Miller. Annual engineering rept. on Contract Nonr-2145(00). 11 Oct 57, 79p. 10 refs. AD-145 107.
Order from LC mi$4.50, ph$12.30 PB 138 883

A discussion is presented of fixed program storage techniques employing mechanical, electromechanical, electronic, optical, and magnetic devices. Twelve memory schemes and 5 selection techniques are investigated as well as 9 currently unsuitable methods; these may eventually become applicable in some new development or they may prompt a fresh approach to the problem. From a comparison of the suitable techniques, the following conclusions are drawn: (1) no single scheme is outstanding for program storage

for real-time military computers; (2) the fastest technique is CRT storage; (3) magnetic storage is also fast, but as the speed of operation goes up, the mutual inductance goes down and S/N troubles increase; (4) the best volume-per-bit is obtained by a tightly assembled bank of wired cores of the one-core-per-word type, but this presents fabrication problems and the storage lacks flexibility; (5) storages which are passive electrically and solidly immobile mechanically are probably the most reliable (wired cores for example); and (6) a machine which stores almost the correct program is probably useless, because of the difficulties encountered in correcting programming errors or making changes; the optical scheme in this case is superior to the wired cores. A table is presented for making qualitative comparisons among the techniques. Volume-per-bit formulas are developed; they do not include allowance for address decoding or driving circuitary. Magnetic storage is also discussed.

David Sarnoff Research Center, Princeton, N. J.
DIRECT-COUPLED UNIPOLAR TRANSISTOR LOGIC. PART 1. PRELIMINARY STUDY, by J. T. Wallmark. Scientific rept. no. 1 on Contract AF 19(604)1957. 15 Sep 58, 40p. 7 refs. AFCRC TN-58-587; AD-207 169.
Order from LC mi$3.00, ph$6.30 PB 139 233

A new logic system using unipolar transistors is discussed. Some of its basic features are derived theoretically. It is concluded that important advantages over existing logic systems may be gained. For example, one important advantage is that this system is particularly suited to a very compact integrated type of construction.

David Taylor Model Basin, Washington, D. C.
SURVEY OF ANALOG-TO-DIGITAL CONVERTERS, by Sidney Lechter. Sep 58, 140p. 13 refs. Rept. 1257.
Order from LC mi$6.90, ph$21.30 PB 142 857

Based on the results of a survey, the specifications of the latest Analog-to-Digital converters are given. These specifications emphasize the input, Output, and physical characteristics. Typical applications are also given. Comparative tablets and a bibliography are included.

International Business Machines Corp., Poughkeepsie, N. Y.
SPEECH RECOGNITION. Annual summary rept. no. 1 on Contract Nonr-2101(00). July 57, 18p. AD-140 933.
Order from LC mi$2.40, ph$3.30 PB 138 917

Research was undertaken to define a machine which will recognize speech with minimum constraints on the range of speakers and their vocabulary. Methods of analysis were studied, and an analytic system was conceived for the digital computer. Descriptions are given of 2 models of an anolog-to-digital converter. One system, although not completely satisfactory, serves for writing and testing computer program systems. The second model is greatly improved and is to be tested soon. The system of programs is explained and printouts of the spectra for the vowel phonemes are given. Additional study will place emphasis on speech analysis rather than on analytic methods.

Naval Research Lab., U. of Wisconsin, Madison.
SUBROUTINE FOR ADDITIONS AND MULTIPLICATIONS OF POLYNOMIALS OF ANY DEGREES, by Choong Yun Cho. Rept. on Contract N7onr-28511. 24 Mar 58, 9p. 2 refs. WIS-ONR-33.
Order from LC mi$1.80, ph$1.80 PB 139 254

A prototype interpretive system for the addition, subtraction, and multiplication of polynomials of arbitrary degree in a single real variable is described for use on the IBM 650 computer equipped with index registers. The structure of the pseudo instruction in the interpretive scheme is of three address type, a single digit being used to define the instruction, and three three-digit numbers being used to specify the locations of factor and result polynomials.

RCA Service Co., Camden, N. J.
TEST AND EVALUATION OF THE CLOVERLEAF FIXED-PATH TRAFFIC CONTROL COMPUTER, by D. G. Peterson. Scientific rept. no. 1 on Contract AD 19(604)1882. 29 May 59, 34p. 1 ref. AFCRC-TN-59-361; AD-217 036.
Order from LC mi$3.00, ph$6.30 PB 142 832

This report includes an evaluation of the original development model of the Cloverleaf fixed-path computer and a limited evaluation of additional functions which were included in the second development model. The original model accepted range and azimuth information of an aircraft and computed heading and velocity corrections for control purposes. The second model accepts altitude as well as range and azimuth information. The computations include altitude corrections, rate of descent, and limits of the descent in addition to heading and velocity corrections. An additional function of a variable elusive point was added to the original model during its evaluation and a limited amount of information was gathered on this function. The description given herein of the Cloverleaf system is based on the second development model.

Rome Air Development Center, Griffiss AFB, N. Y.
DATA PROCESSING SYSTEM STANDARDS FOR USAF ELECTRONIC SYSTEMS, by Irving J. Gabelman. June 59, 8p. RADC TN-59 172; AD-216 026.
Order from LC mi$1.80, ph$1.80 PB 142 933

This report stresses the requirement that data processing system standards be set so that selected data exchange may be made throughout the Air Force and the Department of Defense.

Rome Air Development Center, Griffiss AFB, N. Y.
IMAGINARY AXIS TRANSLATION OF TRANSFER FUNCTIONS, by Joseph L. Ryerson. Nov 58, 14p. RADC-TR-58-152; AD-205 917.
Order from LC mi$2.40, ph$3.30 PB 139 090

This paper describes a method of constructing analog computers by the use of high Q resonance devices which may be driven electro-magnetically, acousti-

cally, or mechanically. It is shown that the high Q resonant circuit may be considered as performing integration in the frequency domain.

Sibley School of Mechanical Engineering, Cornell U., Ithaca, N. Y.
THE CORNELL RESEARCH SIMULATOR, by Richard W. Conway, Bruce M. Johnson, and William L. Maxwell. Rept. on Contract Nonr-401(32). 1 Oct 58, 10p.
Order from LC mi$1.80, ph$1.80 PB 142 819

The Cornell Research Simulator is intended to simulate the operation of a system that consists of a network of queues. The components of such a system are two or more service facilities, a sequence of arrivals requiring service, and a set of operating disciplines. Arrivals may require the successive services of various of the service facilities before they are completely "served" and discharged from the system. Of the many actual examples of such systems, perhaps the most important is the process-organized manufacturing facility, commonly called the "job shop." Since it is anticipated that the study of the operation of such a shop will be the primary use of the CORE Simulator the terminology has been drawn from that context.

Stanford U., Calif.
THE DUAL SIMPLEX ALGORITHM FOR BOUNDED VARIABLES, by Harvey M. Wagner. Technical rept. no. 50 on Contract N6onr-25133. 20 Mar 58, 10p. 14 refs.
Order from LC mi$1.80, ph$1.80 PB 138 721

Washington U., Seattle.
IBM TYPE 650 PROGRAM LIBRARY REPORT. Rept. on Contract Nonr-477(08) and Public Health Research Grant M-743(C3). July 58, 250p. 1 ref.
Order from LC mi$11.10, ph$37.80 PB 143 032

At the University of Washington two research programs are in progress, the Predictor Selection Studies under the Office of Naval Research, and the Personal Data Studies under a Public Health Grant. Both of these programs involve extensive multivariate psychological analyses. The new high speed computing equipment vastly increases the volume of research which can be undertaken, in addition to providing the most efficient and economical methods available for data analyses. But as more and more programs, routines, and subroutines became available for the IBM Type 650, it became apparent that it would be both desirable and necessary to select and develop these procedures into an integrated system of library programs and card decks which could be used to solve the multivariate analysis problems that arise. This report is a compilation of such procedures for the IBM Type 650. In addition to listing the current contents of the Division of Counseling and Testing Services Program Library, it gives the specific instructions needed for all library decks not reported separately. Some of the decks are used primarily for developmental research, while others represent the applications resulting from the research. The current report is "expandable" so that supplementary reports can be easily added. It is a modification and expansion of two duplicated manuscripts not previously submitted as technical reports, dated December 1956, and March 1957. Except for the additional material and change in format, it does not supersede the original manuscripts.

Washington U., Seattle. Div. of Counseling and Testing Services.
AN IBM TYPE 650 PROGRAM FOR A NON-SYMMETRIC CORRELATION MATRIX WITH SUMMED QUANTITIES, by August Dvorak and Calvin E. Wright. Rept. on Contract Nonr-477(08) and Public Health Research Grant M-743(C3). Aug 58, 11p. 3 refs.
Order from LC mi$2.40, ph$3.30 PB 142 813

Washington U., Seattle. Div. of Counseling and Testing Services.
AN IBM TYPE 650 PROGRAM FOR A SYMMETRIC CORRELATION MATRIX WITH SUMMED QUANTITIES, by August Dvorak and Calvin E. Wright. Rept. on Contract Nonr-477(08) and Public Health Research Grant M-743(C3). Aug 58, 10p. 3 refs.
Order from LC mi$1.80, ph$1.80 PB 142 814

(See also PB 142 813)

Washington U., Seattle. Div. of Counseling and Testing Services.
A MODIFIED PRINCIPAL AXES FACTOR ANALYSIS SOLUTION PROGRAMMED FOR THE IBM TYPE 650, by Clifford E. Lunneborg and Calvin E. Wright. Rept. on Contract Nonr-477(08) and Public Health Research Grant M-743(C3). Aug 58, 10p. 7 refs.
Order from LC mi$1.80, ph$1.80 PB 142 815

Washington U., Seattle. Div. of Counseling and Testing Services.
A SIMPLIFIED ANALYTIC ITERATIVE ROTATION PROGRAM FOR THE IBM TYPE 650, by Paul Horst, Calvin E. Wright and others. Rept. on Contract Nonr-477(08) and Public Health Research Grant M-743(C3). Aug 58, 19p. 7 refs.
Order from LC mi$2.40, ph$3.30 PB 142 816

MECHANICS

American Machine and Foundry Co., Chicago, Ill.
TRANSIENT DRAG AND ITS EFFECT ON STRUCTURES. VOL. II. BIBLIOGRAPHY TO FINAL REPORT, by M. Lorraine Liggins. Rept. on Contract AF 33(616)2285. 24 Feb 55, 74p. 217 refs. MR 1013; AD-59 870.
Order from LC mi$4.50, ph$12.30 PB 143 278

The references gathered in this literature search, including the references for the final report, are presented in the form of four 3 x 5 inch cards printed on each page which can be separated to form a convenient

card file. The bibliography has been divided into ten categories. The ten categories are as follows: I. Drag force on sharp-edged models; II. Drag on cylinders, ellipsoids, spheres and airfoils; III. Wind loading on buildings; IV. Structural behavior under wind forces; V. Transient loads on structures; VI. Structural dynamics; VII. Mathematical analysis of drag; VIII. General fluid flow; IX. Experimental devices and wind control.

Army Transportation Research and Engineering Command, Fort Eustis, Va.
A SIMPLIFIED RHEOLECTRIC ANALOGY OF PLANE STRESS AND ITS APPLICATION TO THE DETERMINATION OF STRESS CONCENTRATION FACTORS, by Larry S. Mickel. Master's thesis (Georgia Inst. of Tech.) May 59, 31p. 9 refs. Research Technical memo. 28; AD-214 497.
Order from LC mi$3.00, ph$6.30 PB 142 992

This report presents a simplified analogy method for the solution of plane stress problems involving thin elastic plates uniformly loaded in tension on two opposite edges. The solutions involved are given in terms of stress concentrations about discontinuities in the plates in the form of holes and cutouts. The simplified analog is expected to provide rapid and inexpensive solutions to certain stress problems, with results compatible with the more established means of solution.

Ballistic Research Labs., Aberdeen Proving Ground, Md.
STRONG SHOCKS AND STRESS-STRAIN RELATIONS IN SOLIDS, PART I, by J. Dewey. Apr 59, 30p. 14 refs. Rept. no. 1074.
Order from LC mi$2.70, ph$4.80 PB 143 144

A general method of applying the finite strain theory of Murnaghan to shocks and pulses having steep fronts is developed with proofs of the relations between Hugoniots and adiabatic strain energies. Some modification of Murnaghan's expressions which are convenient to describe shocks in solids are developed, with formulae for computation.

Brown U. Div of Applied Mathematics, Providence, R. I.
THE SIMILARITY SPECTRA IN ISOTROPIC TURBULENCE USING KOVASZNAY'S FORM FOR THE TRANSFER FUNCTION, by W. H. Reid and D. L. Harris (David Taylor Model Basin). Technical rept. no 17 on Contract Nonr-562(07). Oct 58, 64p. 12 refs. 562(07)/17.
Order from LC mi$3.90, ph$10.80 PB 143 039

Similarity solutions are given for the energy spectrum and transfer function in the initial period of decay for a range of values of the Reynolds number using the transfer theory suggested by Kovásznay. A comparison between the present results and those obtained by using Heisenberg's transfer formula is also made. Some results for the transfer function in the final period of decay are also given.

Brown U. Div. of Applied Mathematics, Providence, R. I
SOME TOPICS IN FINITE ELASTICITY, by R. S. Rivlin. Technical rept. no. 43 on Contract Nonr-562(10). July 58, 64p. 37 refs. C11-43.
Order from LC mi$3.90, ph$10.80 PB 143 099

Brown U. Div. of Applied Mathematics, Providence, R. I
STRAIN-HARDENING AND STRAIN-RATE EFFECTS IN THE IMPACT LOADING OF CANTILEVER BEAMS, by G. R. Cowper and P. S. Symonds. Technical rept. no. 28 on Contract Nonr-562(10). Sep 57, 48p. 7 refs. C11-28; AD-144 762.
Order from LC mi$3.30, ph$7.80 PB 139 019

The problem of impact loading of a cantilever beam which exhibits either strain-hardening or strain-rate sensitivity is considered. On the basis of an assumption concerning the mode of deformation of the beam, the motion of the beam is analysed. The influence of strain-hardening and strain-rate sensitivity on the permanent deformation is calculated. In addition, numerical results are presented for the predicted plastic strains and strain-rates within the beam. Finally, directions in which an extension of the analysis is desirable, are indicated.

Harvard U. Div. of Engineering and Applied Physics, Cambridge, Mass.
A REASSESSMENT OF DEFORMATION THEORIES OF PLASTICITY, by Bernard Budiansky. Technical rept. no. 2 on Contract Nonr-1866(02). Mar 58, 24p. 8 refs.
Order from LC mi$2.70, ph$4.80 PB 139 264

It is shown that deformation theories of plasticity may be used for a range of loading paths other than proportional loading without violation of general requirements for the physical soundness of a plasticity theory. The extent to which deviations from proportional loading are admissible on this basis is calculated quantitatively for the simple deformation theory of Nadai. It is shown that the lower the strain hardening rate of the uniaxial stress-strain curve, the greater are the permissible deviations from proportional loading.

Illinois Inst. of Tech., Chicago
THE ENGINEERING SIGNIFICANCE OF LIMIT ANALYSIS, by Philip G. Hodge, Jr. Rept. on Contract Nonr-1406(04). Apr 58, 12p. 5 refs. DOMIIT rept. no. 1-1.
Order from LC mi$2.40, ph$3.30 PB 139 365

By definition, the limit load on a structure is the unique magnitude of the given loads under which a structure can first deform if it is made of a rigid-perfectly plastic material. The significance of the limit load for a structure made of a real material is discussed in relation to a simple truss.

Institute for Fluid Dynamics and Applied Mathematics, U. of Maryland, College Park.
RAYLEIGH'S PROBLEM IN HYDROMAGNETICS: IMPULSIVE MOTION OF A POLE-PIECE, by G. S. S. Ludford. Rept. on Contract AF 49(638)154. Nov 58, 24p. 5 refs. Technical note BN-151; AFOSR TN-58-1073; AD-207 242.
Order from LC mi$2.70, ph$4.80 PB 139 152

In this paper we consider the motion of an incompressible, viscous, electrically conducting fluid contained between the parallel, plane, pole-pieces y = O, h, of a permanent magnet which provides a uniform external field in the y - direction. Starting at time t = O, with the fluid at rest, the magnet is made to move uniformly in the negative x - direction.

Pennsylvania State U., University Park.
CREEP DEFORMATION IN A SINGLE RIVETED STRUCTURAL JOINT UNDER AXIAL TENSION, by Joseph Marin. Rept. for Mar-Dec 57 on Materials Analysis and Evaluation Techniques, Contract AF 33(616)2729. June 59, 14p. 13 refs. WADC Technical rept. 57-757; AD-216 712.
Order from OTS $0.50 PB 161 036

A review and study of the literature shows that efforts to determine the creep of riveted joints have been confined primarily to experimental investigations on the overall creep in various types of riveted joints. Little attention has been given to the theoretical prediction of the creep deformation of a riveted joint from the basic simple tension creep strain-stress relation for the material. It is the purpose of this report to outline a procedure for theoretically predicting the creep deformation of a simple riveted joint. This procedure attempts to consider the creep of the component parts in a riveted joint.

Pennsylvania State U., University Park.
STRESS DISTRIBUTION IN A PLATE WITH A HOLE SUBJECTED TO AN AXIAL LOAD AND CREEP, by Joseph Marin. Rept. for Mar-Dec 57 on Materials Analysis and Evaluation Techniques, Contract AF 33(616)2729. June 59, 21p. 3 refs. WADC Technical rept. 57-756.
Order from OTS $0.75 PB 161 035

In evaluating the creep in a riveted joint, the creep of the component parts of the joint must be considered. That is, the creep of a riveted joint is made up of the creep in the plates plus the creep of the rivets. Since the creep of the plates is influenced by the presence of holes in the plates, it was considered necessary to determine the creep deformations in a plate with a hole when subjected to axial tension. In order to obtain these creep deformations it is necessary first to determine the creep stresses in an axially loaded plate with a hole. This report gives an approximate analysis of these stresses.

Polytechnic Inst. of Brooklyn, N. Y.
CREEP-STRESS ANALYSIS OF THIN-WALLED STRUCTURES, by Sharad A. Patel, K. A. V. Pandalai, and B. Venkatraman. Rept. on Contract AF 49(638)302. July 59, 44p. 10 refs. PIBAL rept. no. 497; AFOSR TN-59-665.
Order from LC mi$3.30, ph$7.80 PB 142 975

This report presents some methods of stress analysis of thin-walled structures subject to creep. It is assumed that the structures considered are maintained at a uniform temperature so that no thermal stresses are present. It is also assumed that the elastic deformations are negligible in comparison with creep deformations. Under these assumptions, the creep problems of thin-walled structures are first reduced to analogous problems of the same structures made of nonlinear elastic materials. The stress analyses are then carried out with particular reference to structures with closed and open cross sections and subjected to pure torsion, bending, and shear.

Aerodynamics and Pneumatics

AeroChem Research Labs., Inc., Princeton, N. J.
GENERATION OF SUPERSONIC DISSOCIATED AND IONIZED NON-EQUILIBRIUM STREAMS, by D. E. Rosner and H. F. Calcote. Rept. on Contract AF 49(638)300. Oct 58, 35p. 10 refs. AeroChem TM-10; AFOSR TN-58-1080; AD-207 590.
Order from LC mi$3.00, ph$6.30 PB 139 153

An estimate has been made of the magnetic field strength necessary to produce easily measurable magnetogasdynamic effects on aerodynamic heat transfer rates in the laboratory. Under conditions of the experiments reported on here, one would require magnetic field strengths of about 10^4 gauss. Approximately this same field strength is computed as required for high temperature plasma jets discharging at one atmosphere. Furthermore, probe observations indicate that the stream carries a net charge; thus, still stronger magnetogasdynamic interactions are anticipated.

Aeroelastic and Structures Research Lab., Mass. Inst. of Tech., Cambridge.
THEORETICAL AND EXPERIMENTAL PRESSURE DISTRIBUTIONS ON LOW ASPECT RATIO WINGS OSCILLATING IN AN INCOMPRESSIBLE FLOW, by W. R. Laidlaw. Rept. on Contract NOas 52-576-c. Sep 54, 322p. 44 refs. Technical rept. 51-2.
Order from LC mi$11.10, enl pr $51.60 PB 136 333

The distribution of lifting pressure over the surface of low aspect ratio wings oscillating in incompressible flow is studied theoretically and experimentally with results which yield a number of important conclusions about the relative merits of existing lifting surface theories. The theoretical analysis proceeds from the exact integral equation for the oscillating lifting surface as formulated by E. Reissner. The finite wing theories of Prandtl, Weissinger, Reissner, Jones, Garrick, Voss and Lawrence and Gerber are derived from the exact equation by appropriate mathematical simplifications. A new pressure distribution theory for rectangular wings, which has no aspect ratio or reduced frequency limitation and which becomes exact at either zero or infinite aspect ratio, is developed by

the logical extension of the mathematical methods of previous theories. Sample pressure distributions calculated by this theory are compared with the results from other theories. Complete pressure distributions over rectangular, sweptback and delta wings and one wing tip tank configuration were made for simple harmonic pitching and vertical translations in the M. I. T. Low Speed Flutter Tunnel and in still air. The pressures were measured by small barium titanite transducers and integrated numerically to give lift and pitching moment distributions and also total lift and pitching moment coefficients which are compared with the available theoretical aerodynamic data.

Aeronautical Research Lab., Wright Air Development Center, Wright-Patterson AFB, Ohio.
REAL GAS FLOW TABLES FOR NONDISSOCIATED AIR, by Louis G. Kaufman II. Rept. on Hypersonic Flow Techniques. Jan 59, 264p. 7 refs. WADC Technical rept. 59-4; AD-209 388.
Order from OTS $4.00 PB 151 707

One-dimensional, high-speed air flow characteristics are tabulated herein. Stagnation pressure and temperature; density ratio across a normal shock wave; and Mach number, static pressure and temperature, and stagnation pressure and temperature behind a normal shock wave are tabulated for several sets of given conditions which are free-stream Mach number and static pressure and temperature. The Beattie-Bridgeman equation of state, widely accepted as one of the best, empirical, pressure-temperature-density relationships for air, is used in the calculations. The equation includes the effects of molecular vibrational energy which become important for high speed flows; the neglect of these effects in perfect gas law tables leads to considerable errors, even when so-called correction factors are included. The tables herein cover the range of flight and wind tunnel conditions wherein the vibrational effects are important but before dissociation effects become important.

Aircraft Lab., Wright Air Development Center, Wright-Patterson AFB, Ohio.
THE WALL PRESSURE DISTRIBUTION IN A CHOKED TUNNEL, by Gottfried Guderley. Rept. on Two-Dimensional and Axially Symmetric Transonic Flow. Dec 53, 39p. 3 refs. WADC Technical rept. 53-509; AD-34 208.
Order from LC mi$3.00, ph$6.30 PB 139 014

The problem is similar to that discussed in the thesis of B. Marschner (The Flow Over a Body in a Closed Wind Tunnel and in a Sonic Free Jet., California Institute of Technology, 1953) concerning tunnel-wall influence on pressure distribution in a choked tunnel is determined under the assumption that the wind tunnel is very wide in comparison to the model dimensions. By the calculus of residues, the solution is brought into a suitable form for evaluation.

Applied Physics Lab., Johns Hopkins U., Silver Spring, Md.
AIRFOIL PRESSURES AT SUPERSONIC SPEEDS UNDER SEPARATED FLOW CONDITIONS, by Carlo Ferrari. Rept. on Contract NOrd-7386. Aug 57, 86p. 6 refs. Bumblebee Series rept. no. 269.
Order from LC mi$4.80, ph$13.80 PB 139 240

A mathematical analysis is made of the pressures produced on a general two-dimensional supersonic airfoil when the boundary layer is separation phenomena in altering drastically the flow over the entire aft end of the profile, in contradistinction to what is premised when the boundary layer is turbulent. Moment changes can be of the order of 30 per cent between free-flight with an untripped boundary layer, and what might be measured in a high-speed tunnel having a turbulent stream; similarly, lifts might easily be reduced by 10 per cent.

Arnold Engineering Development Center [Tullahoma, Tenn.]
BASE PRESSURE EFFECTS RESULTING FROM CHANGES IN TUNNEL PRESSURE RATIO IN A TRANSONIC WIND TUNNEL, by L. E. Rittenhouse. Rept. on ARO, Inc., Contract AF 40(600)700 S/A 13(59-1). Jan 59, 52p. 7 refs. AEDC-TN-58-88; AD-207 771.
Order from LC mi$3.60, ph$9.30 PB 138 727

Effects of tunnel pressure ratio on test model base pressure measurements were determined for a finite- and infinite-length cylindrical body with both a blunt base and boattail afterbody throughout the Mach number range from 0.70 to 1.40 in the 1-Ft Transonic Tunnel, AEDC. The pressure ratios required to obtain correct base pressures independent of base station location are given for subsonic and supersonic tunnel operation under the conditions of this investigation. Variations in base pressure coefficient as a function of Mach number for blunt-base models of 0.50 percent and 3.25 percent tunnel blockage ratio are compared with free-flight data.

Arnold Engineering Development Center, Tullahoma, Tenn.
EXPERIMENTAL DETERMINATION OF JET SPREADING FROM SUPERSONIC NOZZLES AT HIGH ALTITUDES, by E. K. Latvala and T. P. Anderson. Rept. on ARO, Inc., Contract AF 40(600)700 S/A 13 (59-1). Jan 59, 26p. 4 refs. AEDC-TN-58-98; AD-208 546.
Order from LC mi$2.70, ph$4.80 PB 138 728

This report describes the results of an experimental investigation of the jet spreading of underexpanded supersonic jets. A 13° conical nozzle with an area ratio of 5 was used. Unheated air was used as the working fluid. Ratios of nozzle exit pressure to ambient pressure ranging from 9 to 623 were obtained. It was found that the initial portion of the jet boundaries could be approximated by circular arcs having the same radii for the range of pressure ratios tested. Existing theories predict the spreading of the jet quite well for the region of examination covered by these tests.

Brown U. Div. of Engineering, Providence, R. I.
REVERSE FLOW AND SUPERSONIC INTERFERENCE, by Joseph H. Clark. Rept. on Contract

AF 18(600)664. July 58, 44p. 26 refs. AFOSR TN-58-625; AD-162 155.
Order from LC mi$3.30, ph$7.80 PB 138 870

From a volumetric formulation of the momentum theorem of linearized theory, a general analytic proof is presented, as a preliminary, of the invariance of the drag of an arbitrary spatial distribution of horseshoe vortices and sources under reversal of the undisturbed flow.

California U., Los Angeles.
ANALYTICAL STUDIES OF AIRCRAFT STRUCTURES EXPOSED TO TRANSIENT EXTERNAL HEATING. VOLUME III. THERMAL RESPONSE OF THE SKIN AND SUPPORT FLANGE OF A STRUCTURAL JOINT, by Alphonso Ambrosio and Takao Ishimoto. Rept. on Effect of Atomic Weapons on Aircraft Systems, Contract AF 33(616)293. Jan 55, 285p 12 refs. WADC Technical rept. 54-579; AD-93 137.
Order from LC mi$11.10, ph$44.10 PB 138 968

This report is the third of a series on analytical studies of aircraft structures exposed to transient external heating. Volumes I and II were concerned with the thermal analysis of the skin regions between supports; the present study has been confined to the structural junction consisting of skin and support. The physical system was reduced to two mathematical models termed the double "thin" plate and modified double "thin" plate systems that were analyzed for their response characteristics. (See also PB 138 658)

Colorado State U., Fort Collins.
WIND TUNNEL FOR THE STUDY OF TURBULENCE IN THE ATMOSPHERIC SURFACE LAYER, by J. E. Cermak. Final rept. on Contract AF 19(604)1706. Nov 58, 37p. 8 refs. CER 58JEC 42; AFCRC TR-58-287.
Order from LC mi$3.00, ph$6.30 PB 139 307

Design and construction features of a wind tunnel constructed for the purpose of studying fundamental flow problems associated with the atmospheric surface layer or any application involving low air speeds with heat and/or mass transfer are discussed. Characteristics of the wind tunnel are as follows: (1) Test section size -- 6 x 6 ft by 72 ft long; (2) Turbulence intensity (minimum) -- 0.001 to 0.005; (3) Mean velocity range -- 1 - 100 ft/sec; (4) Mean velocity variation across test section -- ±1 percent of center velocity; (5) Mean velocity steadiness -- ±1 percent of velocity setting; (6) Streamwise pressure gradient -- adjustable to zero. Completed portions of the wind tunnel are illustrated by appropriate photographs.

Guggenheim Aeronautical Lab., Calif. Inst. of Tech. [Pasadena].
INVESTIGATION OF THE TRANSMISSION OF A SHOCK WAVE THROUGH AN ORIFICE, by Louis L. Monroe. Rept. on Hypersonic Research Project, Contract DA 04-495-ORD-19. 25 Sep 58, 63p. 6 refs. Memo. no. 46.
Order from LC mi$3.90, ph$10.80 PB 139 322

A shock wave propagating in air in a shock tube was reflected from an orifice plate, and the strength or Mach number of the transmitted wave was measured for a range of incident shock Mach numbers from 3 to 9 for several types of orifices. Also schlieren photographs of the starting flow pattern were made for some of the orifices investigated. The measured values of transmitted shock strength are compared with predicted values based on a theoretical one-dimensional flow model for both an ideal gas and a real gas.

Institute for System Research, U. of Chicago, Ill.
AERODYNAMIC STUDIES: THE FORCES ACTING ON AN AIR VEHICLE; A REVIEW OF THE LITERATURE [PART 12] by M. Z. Krzywoblocki. Rept. on Contract AF 33(616)5689. Jan 59, 123p. 477 refs. WADC Technical note 56-360, Pt. 12; AD-161 015.
Order from OTS $2.75 PB 161 023

This work is an annotated bibliography of the scientific literature pertaining to methods of calculating the aerodynamic forces acting on an air vehicle in flight. The present segment of the work includes material reviewed by the author in the period October 1954 through December 1954. The more interesting papers and reports (from the viewpoint of the aerodynamicist) are discussed briefly; others are listed without comment. (See also PB 151 820)

Institute for Fluid Dynamics and Applied Mathematics, U. of Maryland, College Park.
TRANSITION FLOW PATTERNS, by John R. Weske. Final rept. on Contract AF 18(600)893. Nov 58, 5p. AFOSR TR-58-130; AD-203 665.
Order from LC mi$1.80, ph$1.80 PB 139 154

Institute for System Research, U. of Chicago, Ill.
AERODYNAMIC STUDIES: THE FORCES ACTING ON AN AIR VEHICLE: A REVIEW OF THE LITERATURE [PARTS 13-14] by M. Z. Krzywoblocki. Repts. on Scientific Engineering Research Investigations in Flight Dynamics. Contract AF 33(616)5689. Jan 59, 2 nos. WADC Technical note 56-360, Pts. 13-14; AD-161 016-AD-161 017.
Order from OTS

Pt. 13, Jan-Mar 55, Jan 59, 121p. 449 refs.
AD-161 016, PB 161 000, $2.75.
Pt. 14, Apr-June 55, Jan 59, 68p. 501 refs.
AD-161 017, PB 161 001, $1.75.
(See also PB 161 023)

Massachusetts Inst. of Tech., Cambridge.
TWO-DIMENSIONAL TRANSONIC UNSTEADY FLOW WITH SHOCK WAVES, by Wiktor Eckhaus. Rept. on Contract AF 49(638)160. May 59, 86p. 17 refs. Fluid Dynamics Research Group rept. no. 59-3; OSR Technical note 59-491; AD-215 844.
Order from LC mi$4.80, ph$13.80 PB 143 002

A study is made of the unsteady flow around an airfoil at transonic Mach numbers, the situation being such that local supersonic regions terminated by shock-waves are present in the vicinity of the airfoil. For the unsteady part of the flow, small perturbations

technique is employed and the interaction with the shock wave is taken into account. The case of an oscillating aileron is considered first, and a solution is derived for the pressure distribution on the aileron.

Midwest Research Inst., Kansas City, Mo.
TABLES OF GENERALIZED AERODYNAMIC FORCES FOR TRIANGULAR WINGS WITH SUPERSONIC LEADING EDGES, by Yudell L. Luke and Henry E. Fettis (Aeronautical Research Lab.). Rept. on Contract AF 33(616)3058. 10 Feb 59, 175p. 4 refs. WADC Technical rept. 58-681; AD-211 654.
Order from OTS $3.00 PB 151 790

This report gives tables of generalized aerodynamic forces on triangular wings with supersonic leading edges. The calculations were performed on the Mark IV at Harvard University, using a series expansion developed in a previous study WADC TR-56-525, PB 137 706. It is assumed that modal descriptions of the triangular wings are available in the form of a double polynomial series in x and y, the chorwise and spanwise coordinates, respectively. A technique to obtain the modes in this manner is discussed in WADC TR-56-335. For the convenience of the user, the present report is a complete entity within itself in that the key equations previously developed are repeated without proof.

Naval Ordnance Lab., White Oak, Md.
LOCAL FLOW CONDITIONS, RECOVERY FACTORS AND HEAT-TRANSFER COEFFICIENTS ON THE NOSE OF A HEMISPHERE-CYLINDER AT MACH NUMBER OF 2.8, by Irving Korobkin. 5 May 53, 33p. 7 refs. Aeroballistic Research rept. 175; NAVORD rept. 2865.
Order from LC mi$3.00, ph$6.30 PB 143 273

Local flow conditions, recovery factors, and heat-transfer coefficients were determined experimentally on the hemispheric nose of a hemisphere-cylinder with a laminar boundary layer at a Mach number of 2.8. The investigations were carried out in the NOL 40 x 40 cm Aeroballistics Tunnel No. 2 and the NOL 18 x 18 cm Aerophysics Tunnel No. 3. The measurements indicate that the recovery factor may be expressed by square root of the Prandtl number even in the presence of a pressure gradient. An analysis of the supersonic heat-transfer data indicates that the supersonic values obey a law almost identical to that derived from incompressible theory. A continuous decrease of the heat-transfer coefficient from the stagnation point to the start of the cylinder describes the behavior for both the compressible and incompressible cases which differ only by a constant of proportionality at each station along the hemisphere.

Naval Ordnance Lab., White Oak, Md.
TABULATION OF COMPRESSIBLE TURBULENT BOUNDARY LAYER PARAMETERS, by Jerome Persh and Roland Lee. 1 May 56, 323p. 2 refs. Aeroballistic Research rept. 337; NAVORD rept. 4282.
Order from LC mi$11.80, ph$50.10 PB 143 272

The tabulated results of an extensive series of calculations of the momentum thickness ratio (θ/δ), displacement thickness ratio (δ^*/δ), and the boundary-layer shape parameter for compressible turbulent boundary layers are presented. For these calculations the power profile form of the velocity profile was used in conjunction with the quadratic form for the temperature profile. Results are presented for power profile exponents of 5, 7, 9, and 11, Mach numbers from 0 to 20, and a range of heat-transfer parameters ($T_w - T_e/T_\infty$) from -10 to +10.

Polytechnic Inst. of Brooklyn, N. Y.
AN EXTENSION OF THE LINEARIZED CHARACTERISTICS METHOD FOR CALCULATING THE SUPERSONIC FLOW AROUND ELLIPTIC CONES, by Anthony Martellucci. Rept. on Contract AF 49(638)217. June 59, 59p. 12 refs. PIBAL rept. no. 517; AFOSR TN-59-632.
Order from LC mi$3.60, ph$9.30 PB 142 978

The method of linearized characteristics as applied by Ferri to the flow about elliptic cones can be used to determine the surface pressure distribution, even when only linear terms are kept in the boundary conditions, provided an area rule requirement is satisfied. In addition, the method can be applied for angles of attack provided the elliptic body geometry is specified in a manner so as not to distort the cross section. Experimental results were obtained for several conical bodies and the results are presented. The surface pressure distribution obtained by this modified method is in reasonable agreement with experiment over the range of Mach number and semidiameter ratio range considered.

Princeton U., N. J.
SOLUTION OF THE THREE-DIMENSIONAL LAMINAR BOUNDARY LAYER OVER THE SURFACE OF A ROTATING CONE, by Ching-Sheng Wu. Rept. on Contract AF 18(600)493. Apr 58, 19p. 2 refs. Rept. no. 415; AFOSR TN-58-301; AD-154 211.
Order from LC mi$2.40, ph$3.30 PB 142 902

The problem under study is the investigation of the motion of an incompressible viscous fluid induced by a spinning cone. Similar solutions have been found from the steady state boundary layer equations. It is of great interest to note that part of the numerical results are similar to that in Karman-Cochran's solution for infinite disc. The pressure distribution across the boundary layer is obtained by simple integration.

Rensselaer Polytechnic Inst., Troy, N. Y.
STUDY OF SOME SUPERSONIC ROTATIONAL FLOW PROBLEMS BY A PERTURBATION TECHNIQUE, by C. Thyagarajan and K. T. Yen. Rept. on Contract AF 49(638)23. Apr 58, 34p. 9 refs. TR AE5803; AFOSR TN-58-624; AD-162 154.
Order from LC mi$3.00, ph$6.30 PB 138 976

A small perturbation technique using generalized coordinates formed by streamlines and their orthogonal trajectories is applied to the anlaysis of some supersonic rotational inviscid flows. With a properly prescribed pressure distribution on a body surface in generalized coordinates, the body shape and the pressure field in the physical plane can be determined.

Rensselaer Polytechnic Inst., Troy, N. Y.
A STUDY OF VORTEX PRODUCTION IN PIPE FLOW, by George Delforge. Rept. on Contract AF 18(600)681. Apr 58, 67p. 13 refs. TR AE5808; AFOSR TR-58-60; AD-158 205.
Order from LC mi$3.90, ph$10.80 PB 143 233

A brief review of the Theodorsen theory in which he describes the origin and basic structure of turbulence is presented. The experimental procedure used and results obtained in attempting to find the basic structure occurring when a flow is transformed from a laminar to a turbulent nature by the use of artificial disturbances, and verification of results obtained by other investigators is given. From the investigation conducted, it was found that the horseshoe-shaped vortex does exist in laminar pipe flow, for the range of Reynolds numbers investigated, when the flow is suddenly interrupted by an artificial disturbance. The sequence of events following the formation of this system of vortices to transition compares with that given by Theodorsen. The inverse relation between the disturbance Reynolds number and transition Reynolds number as predicted by Theodorsen was found to exist. From visual observations, the basic structure of the vortices formed when a flow is transformed from a laminar to a turbulent state without artificial disturbances present appears to be similar to that obtained with artificial disturbances. The above results agree faborably with those found by other investigators.

Rome U. (Italy).
THE EQUIELASTIC MODEL TECHNIQUE IN BLOWN-DOWN WIND-TUNNEL TESTS, by Luigi Broglio. Technical note no. 6 on Contract AF 61(514)888. Dec 58, 42p. 5 refs. SIARgraph no. 46; AFOSR-TN-59-409; AD-214 506.
Order from LC mi$3.30, ph$7.80 PB 143 178

In SIARgraph N. 30 (PB 137 452) Modeling Technique and Theory for Aeroelastic Similarity in Blown-Down Wind Tunnel Tests, the importance of building up an "equielastic model" for solving aeroelastic similarity problems was pointed out. In this Report a general procedure for determining the equielastic model is given. The two main problems, the above procedure is consisting of, are: (1) to find the pressure distribution on a solid model, the spanwise and chordwise rotations being known at every station; (2) to determine the tip rotation for a given wing structure. Both problems are here solved in the most general way. Numerical examples complete the work.

Technion Research and Development Foundation (Israel).
ON ROTATIONAL FLOW PAST THICK AIRFOILS, by Abraham Kogan. Final rept. on Contract AF 61(052)06. Feb 59, 38p. 9 refs. AFOSR TR-59-64; AD-217 033.
Order from LC mi$3.00, ph$6.30 PB 142 940

The inviscid rotational supersonic flow behind the shock wave attached to the sharp leading edge of an airfoil is studied by a transformation of coordinates which introduces the Croco stream function as independent variable. Using expansions in power series of ψ an iterative process is developed for the determination of pressure distribution along airfoil surtace. For the special case of near-shock detachment flow a simple approximation is derived for the flow in the whole region between the airfoil and the shock wave.

Technische Hochschule, Munich (West Germany).
AUXILIARY TABLES FOR THE COMPUTATION OF LINEARIZED WING-BODY INTERFERENCE FLOWS, by Hans J. Stetter. Technical note no. 6 on Contract AF 61(514)1080. 10 Nov 58, 32p. 5 refs. AFOSR-TN-58-1089; AD-207 586.
Order from LC mi$3.00, ph$6.30 PB 139 066

An analysis of the FOURIER-decomposition used in the third step of the quasi-cylindrical method (cf. [1], [2]) for the treatment of the linear wing-body interference problem shows that in a certain region the convergence of the resulting FOURIER-series is necessarily poor. Following the arguments of [2] it is shown how the solution may be composed of two parts such that the poorly convergent part is universal to all problems of this kind whereas the part distinguishing the various examples is better convergent. Tables are presented of the universal portion of the solution of the third step giving the values of the flow component accounting for the local pressure coefficient in a large number of points on both wing and body. Instruction is provided on the use of these tables which reduce the necessary computations to those of the well convergent second portion of the solution.

Technische Hochschule, Stuttgart (Germany).
INVESTIGATION OF THREEDIMENSIONAL VORTEX INSTABILITY, by Franz X. Wortmann. Final technical rept. on Contract AF 61(514)897. Feb 59, 18p. 9 refs. AFOSR-TR-59-59; AD-216 624.
Order from LC mi$2.40, ph$3.30 PB 143 014

This report covers the development and construction of a laminar water tunnel designed for the investigation of a three-dimensional vortex instability of the laminar boundary layer on the concave wall. Both the assignment and the tellurium method have brought up problems for the solution of which entirely new approaches had to be found. Apart from the solution of a large variety of individual problems a rigid, porous corrosion-resistant wall surface was developed for boundary layer suction.

University of Southern California. Engineering Center, Los Angeles.
ON THE LAMINAR BOUNDARY LAYER WITH ARBITRARY PRESSURE GRADIENT AND WALL TEMPERATURE DISTRIBUTIONS, by James C. Williams, III. Technical note on Contract AF 18(600)1145. 31 July 58, 23p. 8 refs. USCEC rept. 40-204; AFOSR-TN-58-583; AD-162 103.
Order from LC mi$2.70, ph$4.80 PB 138 752

The laminar boundary layer equations for a compressible heat conducting gas are first transformed by the Stewartson transformation. The transformed equations are then attacked by the Blasius series procedure which is well known in incompressible boundary layer theory. This procedure yields a number of pairs of simultaneous ordinary differential equations which, when solved, define the boundary layer on a body with an arbitrary

pressure distribution. The method also allows for an arbitrary wall temperature distribution or an arbitrary heat transfer rate distribution along the body. The resulting equations can probably best be solved on modern high speed computing machines.

University of Southern California. Engineering Center, Los Angeles.
A STUDY OF THE FEASIBILITY OF THE DIRECT CONDENSATION OF A SUPERSONIC STREAM, by Howard Wong and James C. Williams, III. Technical note on Contract AF 18(603)95. 31 July 58, 34p. 8 refs. USCEC rept. 56-204; AFOSR TN-58-712; AD-162 247.
Order from LC mi$3.00, ph$6.30 PB 138 864

A pilot model wind tunnel was designed and developed for study of the possibility of using direct condensation (into a liquid) of a supersonic jet to sustain flow in a wind tunnel. This work was carried out at the low density project at the Engineering Center of the University of Southern California. The tunnel, using ethyl alcohol as the working fluid and liquid nitrogen as the coolant, was designed for Mach number of 3, stagnation pressure of 4.07 mm Hg, and stagnation temperature of 357°K.

Wichita U. [School] of Engineering, Kans.
EXPERIMENTAL INVESTIGATION OF A MEANS OF OBTAINING INDEPENDENT CONTROL OF LIFE AND DRAG IN LANDING APPROACH, by J. L. Stalter and Robert K. Wattson, Jr. Rept. on Contract DA 44-177-tc-356. Apr 59, 64p. 8 refs. Engineering rept. no. 315-5; AD-216 110.
Order from LC mi$3.90, ph$10.80 PB 143 095

A wind tunnel investigation has been carried out with the objective of determining whether it is possible to control the lift and drag of fixed wing STOL airplanes independently, thereby enabling improvements in the consistency with which maximum performance landings may be made. The mechanism of control is a combination of circulation control by blowing, and wing flap deflection, varied simultaneously or individually. The independent control of lift and drag has been shown to be possible within limits necessary to provide steady landing approaches with glide angles between, roughly, six and eighteen degrees, and with approach lift coefficients as high as 4.4. The application of the wind tunnel data to the analysis of a class of hypothetical transport aircraft has shown that the system investigated is compatible with STOL propeller airplane geometries and powers. To utilize the lift-drag control system to its maximum capability, it is necessary on aircraft of any wing loading to execute at least a partial flare at the end of the approach in order to assure a normal touchdown attitude. The necessity to execute a full flare is determined by the wing loading and the energy absorption capability of the gear.

Hydrodynamics, Hydraulics, and Hydrostatics

Air Force Missile Development Center, Holloman AFB, N. Mex.
KINETIC SOLID-LIQUID FRICTION (SLIP), by S. Kryopoulos. May 59, 61p. 95 refs. AFMDC TN-59-10; AD-215 461.
Order from LC mi$3.90, ph$10.80 PB 142 951

A literature search covering surface flow and roughness, cavitation, wettability and slip and cavitation and wettability combined. Stress has been laid on a physico-chemical discussion of the conditions which may lead to solid-liquid friction ("slip"), adapted to the understanding of the hydrodynamicist and engineer. Cavitation has also been considered and suggestions for experimentation are presented.

Brown U. Div. of Applied Mathematics, Providence, R. I.
WATER WAVES - SOME ASPECTS OF THE NON-LINEAR THEORY, by L. Milne-Thomson. Technical rept. no. 14 on Contract Nonr-562(07). Mar 58, 23p. 11 refs. 562(07)/14.
Order from LC mi$2.70, ph$4.80 PB 139 253

Hydrodynamics Lab., Calif. Inst. of Tech., Pasadena.
CAVITY SHAPES FOR CIRCULAR DISKS AT ANGLES OF ATTACK, by R. L. Waid. Rept. on Contract NOrd-16200. Sep 57, 32p. Rept. no. E-73.4; AD-146 517.
Order from LC mi$3.00, ph$6.30. PB 138 647

The shape of the cavity formed in water by a circular disk at an angle of attack is derived. The empirical evaluation is based on experimental data obtained with air cavities in the Free Surface Water Tunnel. The effects of model size, free stream velocity and cavitation number on cavity shape are presented. The profile shape of the cavity is assumed to be composed of two superposable phenomena: (1) the cavity shape without gravity effects (2) the displacement of the cavity due to gravity.

Mellon Inst. [of Industrial Research, U. of] Pittsburgh, Pa.
ON HELICAL FLOW OF GENERAL FLUIDS, by Bernard D. Coleman, and Walter Noll (Carnegie Inst. of Tech). Rept. on Contract AF 49(638)541. May 59, 22p. 5 refs. AFOSR TN-59-506; AD-215 931.
Order from LC mi$2.70, ph$4.80 PB 143 029

The problem of the helical flow of a general fluid is solved making no special constitutive assumptions other than incompressibility. It is shown that from a knowledge of the rheologists' viscosity function one can calculate the dependence of the velocity field in helical flow on the geometry and applied forces. The complete stress distribution (including normal stresses) may be calculated from a knowledge of three basic material functions which can, in principle, be determined from an experimental study of simple shearing flow. Expressions are derived for the discharge rate and for the angular velocities of the bounding cyclinders as functions of the applied forces.

National Research Labs., Ottawa (Canada)
A DRIFT MONITORING SYSTEM AND A RAPID CALIBRATING TECHNIQUE FOR THE CAPACITIVE

WAVE PROFILE RECORDER, by R. J. Harron. Mar 59, 18p. 2 refs. Mechanical engineering rept. MI-818A.
Order from LC mi$2.40, ph$3.30 PB 142 875

This report describes a method for monitoring the drift which may occur in the capacitive wave profile recorder described in NRC Report MI-818, and also a technique for the rapid calibration of the capacitive probes. A voltage, simulating the at-rest water level, is set up on a potentiometer and is used as a reference for monitoring drift in the system. For calibration, a remotely-controlled motor positions the probe at either of two preset limits approximating the maximum and the minimum height of the waves to be measured.

Wave Research Lab., U. of California, Berkeley.
SCALE EFFECTS OF MODELS OF HYDRAULIC BREAKWATERS, by John A. Williams. Technical rept. on Contract Nonr-222(46). Oct 58, 45p. 9 refs. Series no. 104, issue no. 7.
Order from LC mi$3.30, ph$7.80 PB 143 064

The two dimensional model study described herein involves three different hydraulic breakwater models, each model having a different nozzle (or orifice) area per unit length of breakwater. The model having the largest nozzle (or orifice) area per unit length of breakwater was tested using five different scales varying from full scale (the largest model) to a scale ratio of 8:1. The two remaining models were tested at full scale and at a scale ratio of 4:1. For each model a horsepower-attenuation curve was computed and projected into the large model scale by the Froude Model Law in order to determine the scale effect for a given wave. The nozzles of the model breakwaters were located at the still-water level except for several instances where a horsepower-attenuation curve was determined for the breakwater in a condition of submergence in order to check the effects of such an arrangement on efficiency and scale. In addition the effects of wave steepness and length to depth ratio on breakwater efficiency (in the two dimensional case) were calculated.

Wave Research Lab., U. of California, Berkeley.
THREE-DIMENSIONAL MODEL STUDIES OF HYDRAULIC BREAK-WATERS, by K. Horikawa. Technical rept. on Contract Nonr-222(46). Oct 58, 45p. 8 refs. Series no. 104, issue no. 8.
Order from LC mi$3.30, ph$7.80 PB 143 067

Statics, Kinematics, and Kinetics

Aeroelastic and Structures Research Lab., Mass. Inst. of Tech., Cambridge.
ON LARGE DEFLECTION OF CURVED STRIPS UNDER COMBINED THERMAL AND PRESSURE LOADINGS, by M. M. Chen. Rept. on Contract AF 49(638)160. May 59, 63p. 17 refs. ASRL TR-76-2; AFOSR TN-59-676.
Order from LC mi$3.90, ph$10.80 PB 142 974

The governing equations in various forms for large deflections of initially curved strips, including thermal force and thermal moment effects, are derived based on Reissner's variational principle. Exact solutions are obtained for the cases corresponding to net tensile, compressive, and zero in-plane forces with arbitrary distributed, thermal loads, and small initial curvature. Numerical examples are given for a clamped-clamped strip with a particular initial shape, temperature distribution, and uniform pressure. For the purpose of comparison, approximate solutions based on Reissner's variational principle and minimum potential energy are obtained. In both methods, the vibrational modes, and assumed modes are used. Good agreement is shown in the numerical examples. These approximate methods of solution will be used for the case of finite plates.

Polytechnic Inst. of Brooklyn, N. Y.
CREEP BUCKLING OF CYLINDRICAL SHELLS SUBJECTED TO UNIFORM AXIAL COMPRESSION, by Francis W. French and Sharad A. Patel. Rept. on Contract AF 49(638)302. May 59, 20p. 8 refs. PIBAL rept. no. 489; AFOSR TN-59-538; AD-215 555.
Order from LC mi$2.40, ph$3.30 PB 143 007

The axially symmetric creep buckling of a circular cylindrical shell is investigated. A sandwich shell analogy and a biaxial creep law are used in the analysis. Two simultaneous, nonlinear differential equations are found to govern the stress distribution in and the displacement of the cylinder. A numerical example using these equations is carried out, and the results are presented in the form of curves.

METALLURGY

Imperial Coll., London (Gt. Brit.)
THERMODYNAMICS OF MOLTEN ALLOYS, by Lieh-leng Cheng. Rept. no. 8 (Final) for 1 Jan 57-31 Dec 58 on Contract AF 61(514)1179. Apr 59, 74p. 18 refs. AFOSR TR-59-69; AD-217 816.
Order from LC mi$4.50, ph$12.30 PB 142 939

Dilute solutions of sulphur in liquid tin and lead. Sn-Cu-S, Sn-Ag-S, Sn-Pb-S and Cu-Ag-S systems.

James Forrestal Research Center, Princeton, N. J.
HIGH PRECISION DETERMINATION OF VAPOR PRESSURES OF METALS AND ALLOYS; I. CADMIUM, by Richard J. Borg and C. Ernest Birchenall. Technical rept. no. 1 on Contract Nonr-1858(08). 21 Oct 57, 17p. 6 refs. Metallurgy rept. no. 14.
Order from LC mi$2.40, ph$3.30 PB 138 899

An apparatus is described for obtaining extremely high precision vapor pressure data based on the knudsen effusion method. The element Cd has been used to test the apparatus before proceeding with the investigation of certain alloys.

[Naval Ordnance Lab., White Oak, Md.]
THERMENOL IMPROVEMENT FOR AIRCRAFT. Informal progress rept. for Jan-June 56. [1956] 13p. 2 refs.
Order from LC mi$2.40, ph$3.30 PB 138 903

Significant improvements in room temperature ductility of higher aluminum content alloys are possible by careful control of grain size, melting technique, and heat treatment. When given a suitable heat treatment, this alloy exhibited an elongation of 7%. The best ductility in the higher aluminum content alloys was obtained by: maintaining the minimum grain size at all times, adding grain refining materials, heat treating at temperatures above the ordering range followed by oil quenching.

Titanium Metallurgical Lab., Battelle Memorial Inst. Columbus, Ohio.
EXAMPLES OF TWO TECHNICAL INQUIRIES, THE ANSWERS, AND THE RESULTING TECHNICAL MEMORANDA, by Daniel J. Maykuth. 30 Sep 57, 55p. 15 refs.
Order from LC mi$3.60, ph$9.30 PB 138 930

Memoranda on (1) availability of thin-gage titanium alloy sheet, (2) recent advances in the rolling of thin-gage titanium alloy sheet, and (3) corrosion of titanium and titanium-base alloys in liquid and gaseous fluorine.

Ferrous Metals

Defense Metals Information Center, Battelle Memorial Inst., Columbus, Ohio.
DESIGN INFORMATION ON 5Cr ALLOY STEELS FOR AIRCRAFT AND MISSILES, by F. R. Morral, R. J. Favor, and W. P. Achbach. Rept. on Contract AF 18(600)1375. 28 Aug 59, 48p. 7 refs. Rept. no. 116.
Order from OTS $1.25 PB 151 072

This report is a summary of design information pertinent to the use of the 5Cr-Mo-V (H-11 type) alloy steels in aircraft and missile applications. Heat treatment, melting practice, and corrosion protection are considered. Manufacturing problems such as machining, forming, and joining are also briefly discussed. Data on the elevated-temperature mechanical properties of these H-11 type steels have been collected and evaluated. The presentation and evaluation of these data were in accordance with procedures employed by the ANC-5 Committee.

Defense Metals Information Center, Battelle Memorial Inst., Columbus, Ohio.
THE PHYSICAL METALLURGY OF PRECIPITATION-HARDENABLE STAINLESS STEELS, by D. C. Ludwigson and A. M. Hall. Rept. on Contract AF 18(600)1375. 20 Apr 59, 70p. 31 refs. DMIC rept. 111; AD-214 001.
Order from OTS $2.00 PB 151 067

This report summarizes present knowledge on the physical metallurgy of precipitation-hardenable stainless steels. The alloys discussed include the martensitic types (Stainless W and 17-4 PH), the semiaustenitic types (17.7 PH, PH 15-7 Mo, AM 350, and AM 355), and the austenitic types (A-286 and HNM). The areas of metallurgy common to most or all of these materials are discussed on the basis of (1) classification by composition, (2) austenite conditioning, (3) the martensite reaction, and (4) precipitation hardening. The application of metallurgical principles in the handling, heat treatment, and fabrication of these alloys is also discussed.

Naval Research Lab., Washington, D. C.
CHARPY-V TRANSITION TEMPERATURES OF FERRITIC IRON ALLOYS. PART II. IRON-CHROMIUM AND IRON-CHROMIUM-ALUMINUM, by J. E. Srawley. 24 Aug 59, 19p. 8 refs. NRL rept. 5367.
Order from OTS $0.50 PB 151 811

The Charpy-V mid-energy transition temperatures of a series of iron-chromium alloys containing up to 24.3% chromium, and of three series of iron-chromium-aluminum alloys containing up to 25% chromium and 6% aluminum, have been determined for several conditions of mechanical working and heat treatment. The fracture mode of specimens broken below the transition temperature was invariably transgranular. The transition temperatures of the iron-chromium alloys decreased with increasing chromium content when the alloys had been quenched from 1650°F, and increased with increasing chromium content when the alloys were slowly cooled from 1650°F. The effects are not readily explained by the known embrittling mechanisms: 885°F embrittlement and sigma-phase embrittlement. Alloys containing about 0.5% aluminum had significantly lower transition temperatures than corresponding alloys without aluminum. Alloys containing about 5% aluminum had higher transition temperatures than those without aluminum. Manganese contents of up to 12.8% appeared to have no beneficial effect on the transition temperatures of the iron-chromium-aluminum alloys, and titanium contents up to 1.92% raised the transition temperature.

Light Metals

Case Inst. of Tech., Cleveland, Ohio.
THE FACTORS INFLUENCING THE DUCTILITY AND TOUGHNESS OF MAGNESIUM AND ITS ALLOYS, by J. E. Tripp and L. J. Ebert. Final rept. for 1 Aug 56-1 June 58 on Contract DA 33-019-ORD-1360. 15 June 58, 90p. 8 refs. AD-200 025.
Order from LC mi$5.40, ph$15.30 PB 138 722

An investigation was made of the effects of tensile and compressive prestrain at -321°F, room temperature, and 200°F on the tensile and fatigue properties for Mg alloyed with 4, 6, and 11% Li. Prestraining tends to increase the strength and decrease the ductility to the Li-Mg-base alloys. The increased strength (tensile or yield) resulting from prestrain was greatest for the

lowest alloy content and was decreased by an increased Li content. The endurance limit and endurance ratio decreased with increasing Li content in the Mg-Li alloys.

Cornell Aeronautical Lab., Inc., Buffalo, N. Y.
A STUDY OF THE TENSILE AND CREEP-RUPTURE PROPERTIES OF FIFTEEN HEATS OF C-110M TITANIUM ALLOY SHEET, by Frank J. Gillig and Glen J. Guarnieri. Rept. for 15 Jan 54-15 Mar 55 on Materials Analysis and Evaluation Techniques, Contract AF 33(616)2342. Jan 56, 71p. 1 ref. WADC Technical rept. 55-164; AD-91 903.
Order from LC mi$4.50, ph$12.30 PB 138 990

A correlation exists between the room temperature strength properties and the yield and ultimate strengths at 500 and 700°F. However, the creep and rupture properties appear to be independent of the short time tensile strength results even at 700°F, which was the temperature used for creep testing.

Lockheed Aircraft Corp., Palo Alto, Calif.
BERYLLIUM: A SEARCH OF THE UNCLASSIFIED LITERATURE, by Wanda G. Bradshaw. Rept. on Contract NOrd-17017. 1 Nov 59, 58p. 241 refs. LMSD-2260.
Order from OTS $1.50 PB 161 012

Fabrication methods studied included powder-metallurgy methods, extrusion, forging, casting, and welding. Methods for cladding Be and special techniques for the electrodeposition. Special techniques of purification. Properties of Be, such as general metallurgy, physical and mechanical properties, crystallography, effects of radiation, and the stress resistance. Corrosion resistance of Be under gaseous atmospheres such as O_2, N_2, CO_2, and H_2. Resistance of Be to liquid metals, various aqueous media, and organic media. Solid interdiffusion of Be with other metals at elevated temperatures. Information available on the alloys of Be with Al, Cu, Cr, Fe, Mg, Mo, Nb, Ni, Ti, Th, U, V, and Zr. The toxicology of Be, its hazard limits, suitable laboratory and machining methods, and possible means of detection.

Minerals Research Lab., U. of California, Berkeley.
CREEP OF ALUMINUM UNDER EXTREMELY SMALL STRESSES, by J. G. Harper, L. A. Shepard and J. E. Dorn. Technical rept. no. 4 on Contract Nonr-222(49). 15 Aug 57, 27p. 15 refs. Series no. 103, issue no. 4.
Order from LC mi$2.70, ph$4.80 PB 138 933

At high temperatures Al exhibits two laws for creep, dependent on the stress. At stresses below 13.5 psi the creep rate increases linearly with the stress, and at intermediate stresses between 33.5 and 1,000 psi the creep rate increases with a power of the stress. High temperature creep is controlled by two distinctly different crystallographic mechanisms, the relative proportions of each being dependent on the stress. A dislocation model involving motion of jogged screw dislocations appears to account well for the low stress creep behavior of Al. Intermediate stress creep behavior was found to agree with Weertman's dislocation climb creep hypothesis.

Titanium Metallurgical Lab., Battelle Memorial Inst., Columbus, Ohio.
FORMABILITY OF TITANIUM AND TITANIUM ALLOYS, by C. T. Olofson. 30 June 58, 9p. 5 refs.
Order from LC mi$1.80, ph$1.80 PB 138 764

Data presented on the work hardening of several titanium alloys in comparison with common metals. A discussion of factors adversely affecting forming of titanium sheet materials.

Titanium Metallurgical Lab., Battelle Memorial Inst., Columbus Ohio.
STATUS OF ELECTROPLATED TITANIUM COATINGS ON OTHER METALS AND ELECTROFORMED TITANIUM, by John G. Beach. 30 Aug 57, 4p. 14 refs.
Order from LC mi$1.80, ph$1.80 PB 143 231

Application of titanium coatings now is limited to those metals that are not damaged by fused-salt-bath temperatures in the range of 800 to 1000 C, and that do not form weak diffusion alloys with the titanium, and to needs that can justify the cost and problems of working with fused-salt electrolytes.

Nonferrous (except light) Metals

Cornell U., Ithaca, N. Y.
EXPERIMENTAL AND THEORETICAL STUDY OF LOW-TEMPERATURE INTERNAL FRICTION IN COPPER, by Victor K. Paré. Technical rept. no. 4 on Contract AF 18(600)1000. 1 July 58, 182p. 42 refs. AFOSR-TR-58-92; AD-162 133.
Order from LC mi$8.40, ph$28.80 PB 138 958

Internal friction in cold-worked copper single crystals as a function of temperature from 4°K to 300°K, and at strains ranging from 10^{-7} to 2×10^{-5}. Flexural vibration was used, at frequencies in the neighborhood of 5 kilocycles.

Defense Metals Information Center, Battelle Memorial Inst., Columbus, Ohio.
THE ALL-BETA TITANIUM ALLOY (Ti-13V-11Cr-3Al) by R. A. Wood and H. R. Ogden. Rept. on Contract AF 18(600)1375. 17 Apr 59, 199p. 34 refs. DMIC Rept. 110; AD-214 002.
Order from OTS $3.00 PB 151 066

This report summarizes the information available to the Defense Metals Information Center on the metallurgy, properties, and fabrication of a new type of commercial titanium alloy. This alloy contains about 26 per cent alloying elements (13V-11Cr-3Al) and has a body-centered-cubic beta-phase structure in the annealed condition. It was originally developed by Rem-Cru Titanium, Incorporated (now the Titanium Division, Crucible Steel Company of America), and is

now being produced by Crucible Steel Company as B-120VCA, by Republic Steel Corporation as RS-120B, and by Titanium Metals Corporation of America as Ti-13V-11Cr-3Al. Because of the great potential of this alloy, it has been added to the Department of Defense Titanium Sheet-Rolling Program. Detailed data on the heat treatment, mechanical properties, welding, and forming of the all-beta alloy are given in this report.

Office of Ordnance Research, Durham, N. C.
CONFERENCE ON RESEARCH IN PROGRESS ON TUNGSTEN HELD 20-21 MAY 1959 AT DUKE UNIVERSITY. [1959] 102p. 18 refs.
Order from OTS $2.50 PB 161 013

Contents:
Bureau of Mines tungsten program; Impurity analysis in tungsten; Scope of OOR research project on tungsten and some of its alloys; Electron beam melting; Phase equilibria in refractory metals; Abstract constitution of tungsten & tantalum base ternary systems; Research on molybdenum-tungsten, pure tungsten, & tungsten-base alloys at Climax Molybdenum Co.; Tungsten-tantalum alloy development; Tungsten alloy development; ARC casting, purification & fabrication of tungsten; Mechanical properties of tungsten: ARC melting and fabrication of tungsten; The effect of impurities on the properties of tungsten; Ductility of Mo-Re & related refractory alloys; NASA research on tungsten & tungsten alloys; Work at JPL; Effect of selected rare earth additions on the removal of interstitials from tungsten & molybdenum; Research on forgeable refractory alloys of tungsten, tantalum, molybdenum, & columbium; The potential of In-Fab for the conversion of tungsten; Tungsten research: Studies of tungsten coatings; Flame spraying tungsten with gas stabilized ARC; A preliminary study of the protection of tungsten by coatings of rhodium; Fundamental study of the oxidation of tungsten; Oxidation of tungsten; The high temperature oxidation of W-Cb alloys; and General discussion, research-in-progress on high purity tungsten.

Structural Metallurgy and Corrosion

Aeroelastic and Structures Research Lab., Mass. Inst. of Tech., Cambridge.
CREEP BENDING OF PERFECTLY PLASTIC BEAMS, by J. Dugundji and R. I. Johnson. Rept. on Contract Nonr-1841(22). Aug 57, 33p. 12 refs. Technical rept. 25-23; AD-143 744.
Order from LC mi$3.00, ph$6.30 PB 138 932

The creep bending behavior of a beam of rectangular cross-section initially possessing regions of contained plastic deformations is investigated analytically. The beam is assumed to be of perfectly plastic material, and secondary creep of the type $\varepsilon_{creep} = (\sigma/\lambda)^n$ is assumed. The effects of creep exponent n, and the extent of the initial plastic region on the stress redistribution and beam curvatures are observed from some calculations on typical cases. The effects of primary creep, which are neglected in this analysis for simplicity, can be significant and may be accounted for if desired in the calculation procedure.

Ballistic Research Labs., Aberdeen Proving Ground, Md.
AN APPLICATION OF LATENT IMAGE INTENSIFICATION TO FLASH RADIOGRAPHY, by J. J. Misey and A. H. Choy. Dec 57, 13p. 16 refs. Technical note no. 1160; AD-155 138.
Order from LC mi$2.40, ph$3.30 PB 139 182

This report describes the technique of post-exposure as a method of intensifying the latent image of shadowgraphs taken with flash radiography. The film is first subjected to a high intensity, submicrosecond exposure and then exposed a second time to a low intensity exposure for a few minutes. Negatives of improved quality were obtained with the post-exposure technique, consequently the difficulties in radiography caused by shielding and variations in x-ray output are greatly reduced.

Battelle Memorial Inst., Columbus, Ohio.
THE EFFECTS OF SOLUTE ELEMENTS ON THE STRENGTH PROPERTIES OF IRON- AND COBALT-BASE ALLOYS, by Alan K. Wolff, Ervin E. Underwood and others. Rept. for 15 Apr 58-14 Apr 59 on Solid State Research and Properties of Matter, Contract AF 33(616)5652. Apr 59, 71p. 40 refs. WADC Technical rept. 59-258; AD-215 432.
Order from OTS $2.00 PB 161 043

Factors important in high-temperature deformation were investigated in ternary iron-chromium-base alloys. These factors include various temperature, strength, and stability criteria, as well as lattice strain and valency changes. Relationships among these criteria are described. Periodicity of alloy strengthening in cobalt-base binary alloys reveals the most favorable solutes for strengthening, the influence of crystal structure, and the regularity of electronic effects.

Battelle Memorial Inst., Columbus, Ohio.
THE METALLOGRAPHY OF INDIUM ANTIMONIDE, by R. E. Maringer and J. J. Duga. Technical rept. no. 1 on Contract Nonr-1870(00). 15 Jan 58, 12p. 4 refs. AD-153 673.
Order from LC mi$2.40, ph$3.30 PB 138 717

Metallographic techniques were developed to observe dislocation etch-pit arrays in polycrystalline and single-crystal InSb in a study of the effects of deformation and of annealing on deformed InSb. Slip bands, deformation bands, twins, grain-boundary migration, and a number of other deformation effects were visible, all of which are commonly observed during the deformation of metals. Metallographic examination of a re-etched sample which was annealed for 2 hr at 500°C (25° below the melting point of InSb), failed to show any evidence of recrystallization.

Brown U. Div. of Engineering, Providence, R. I.
METALLOGRAPHIC STUDY OF THE DEFORMATION OF A PARTICLE STRENGTHENED ALLOY, WC-Co, by J. Gurland. Technical rept. no. 1 on Contract Nonr-562(19). May 58, 31p. 9 refs. Nonr-562(19)/1.
Order from LC mi$3.00, ph$6.30 PB 138 842

The ductile failure of the cobalt rich alloys is preceded by localized plastic flow of the matrix and by cracking of the carbide grains. The carbide rich compositions failed in a brittle manner by catastrophic propagation of cracks through the carbide grains.

Central Inst. for Industrial Research (Norway).
INVESTIGATION OF THE MECHANISM OF THE OXIDATION OF TITANIUM AND TITANIUM ALLOYS AT HIGH TEMPERATURES, by Per Kofstad. Rept. for 1 Oct 55-31 Mar 57 on Corrosion and Heat Resistant Alloys, Contract AF 61(514)892. June 57, 92p. 55 refs. WADC Technical note 57-231; AD-130 779.
Order from LC mi$5.40, ph$15.30 PB 143 044

A study was made of the reactions of O with Ti between 300° and 1000°C and with various Ti alloys between 800° and 1000°C. The oxidation of Ti was observed to follow the logarithmic rate law below 300°C, the cubic rate law between 300° and 600°C, the parabolic rate law between 600° and 850°C, and a combination of the parabolic and linear rate laws between 900° and 1000°C. The rate laws observed were dependent on the duration of oxidation, and at any definite temperature the rate law eventually changed into the rate law corresponding to the following temperature region.

Dynamic Properties Lab., Calif., Inst. of Tech., Pasadena.
STUDIES OF THE DEFORMATION OF SINGLE CRYSTALS OF ZINC UNDER DYNAMIC CONDITIONS, by Donald S. Clark and Thad Vreeland, Jr. Summary rept. on Contract AF 18(600)490. Nov 58, 18p. 12 refs. AFOSR TR-58-163; AD-207 598.
Order from LC mi$2.40, ph$3.30 PB 138 785

Methods of producing single crystals of zinc have been developed. Distinct differences in static and dynamic stress-strain relations have been shown. A method was devised to study the motion of small angle tilt boundaries under conditions of dynamic loading.

Illinois U., Urbana.
THE EFFECTS OF INELASTIC ACTION ON THE RESISTANCE TO VARIOUS TYPES OF LOADS OF DUCTILE MEMBERS MADE FROM VARIOUS CLASSES OF METALS, by D. M. Sidebottom and S. Dharmarajan. Rept. for Apr-Nov 58 on Design Data for Metals, Contract AF 33(616)5658. May 59, 32p. WADC Technical rept. 56-330, Pt. 10; AD-214 767.
Order from OTS $1.00 PB 151 894

This report presents the results of an analytical and experimental investigation for the determination of the load necessary to produce a specified amount of inelastic deformation in members which are subjected to eccentric tensile loads at elevated temperatures for a specified time. The experimental data were compared with each of two theories which were based on arc hyperbolic sine curve approximation and a two straight line approximation, respectively, of the stress-strain diagram of the material. In the experimental investigation, tests were made on eccentrically-loaded T-section members made of 17-7PH stainless steel at 1000°F. The test members were subjected to an initial eccentricity of either 25 or 51% of the depth. It was found that the deflection of the central section of each member could be predicted by either theory.

Illinois U., Urbana.
ON THE KIRKENDALL EFFECT IN THE HEXAGONAL CLOSE-PACKED PHASE OF CADMIUM AND MERCURY, by D. H. Killpatrick and R. W. Balluffi. Rept. on Contract AF 18(603)106. Dec 58, 25p. 21 refs. AFOSR TN-58-1135; AD-208 084
Order from LC mi$2.70, ph$4.80 PB 138 826

A strong marker shift was found to occur towards the alloy side of the sandwich couples indicating faster diffusion of mercury than cadmium. A very few large isolated voids were found in the vapor-solid couples when mercury was diffused out. The observed Kirkendall effect phenomena are qualitatively similar to those found in cubic systems.

Institute for the Study of Metals, U. of Chicago, Ill.
STRUCTURE OF METALS AND THE NATURE OF THE METALLIC BOND: DEFORMATION OF METALS RESEARCH, by C. S. Barrett. Final rept. on Contract N6ori-02004. Oct 57, 22p. 125 refs.
Order from LC mi$2.70, ph$4.80 PB 138 744

A complete listing of investigations have been completed under this contract. Major fields of research are also listed.

Istituto Elettrotecnico Nazionale "Galileo Ferraris" (Italy).
ELECTRON MICROSCOPY STUDY OF SURFACE STRUCTURES IN HIGH PURITY Al AND IN Al/4% Cu ALLOY: PART II (FINAL), by Guido Bonfiglioli, Andrea Ferro, and Adriana Mojoni. Technical note no. 2c on Contract AF 61(514)1333. [1958] 27p. 5 refs. AFOSR TN-58-1091; AD-207 588.
Order from LC mi$2.70, ph$4.80 PB 138 808

Relations between the substructure of Al and, Al/4% Cu alloy, as controlled by the degree of aging, and the so called "surface substructure" (SSt) which appears when replicas of suitably electro-polished specimens are examined by the Electron microscope. Tentative conclusions are presented, which support the view that the SSt pattern is formed because of a selective oxidization which takes place when electropolishing. (See also PB 137 295)

James Forrestal Research Center, Princeton, N. J.
THE OXIDATION OF METALS AND ALLOYS, by M. Borcsik and R. J. Borg. Final rept. for 1 Sep 53 - 31 Dec 58 on Contract AF 18(600)967. [1959] 39p. 36 refs. AFOSR-TR-59-43; AD-214 525.
Order from LC mi$3.00, ph$6.30 PB 142 506

(1). The absorption of non-collimated radiation in the experimental measurement of diffusion coefficients

by tracer techniques, (2). the plasticity of oxidizes and the effect of pores and cracks on the kinetics of oxidation of metals, (3). the role of defects in oxide and sulfide crystals on conductivity, diffusion, and scale growth, (4). metal-sulfide equilibria for the PbS-Pb, WS_2-W, and Rh_8S_7-Rh pairs, (5). the Fe-Ni-O equilibria and the course of the oxidation reaction of iron-nickel alloys, (6). the variation of self-diffusivity in the Curie point of alpha iron.

Johns Hopkins U., Baltimore, Md.
SLIP VELOCITIES IN SEVERAL METALS AS MEASURED BY INTERFEROMETRIC CINEMICROGRAPHY, by Robert B. Pond and Eleanor Harrison. Rept. on Contract AF 18(600)1587. Aug 58, 57p. 7 refs. AFOSR TR-58-96; AD-162 153.
Order from LC mi$3.60, ph$9.30 PB 138 988

Velocities of edge dislocations propagation are measured and presented for (a) aluminum single crystals of varying orientation which have been extended at a constant rate, (b) aluminum single crystals of relatively constant orientation which have been extended at varying rates, and (c) α Brass and copper single crystals of varying orientation which have been extended at constant rates. The velocity of edge dislocation propagation can be influenced by the juxtaposition in time and space of the slip line among its neighbors as well as by the rate of straining.

Minerals Research Lab., U. of California, Berkeley.
A SURVEY OF RECENT RESULTS ON EXPERIMENTAL DETERMINATIONS OF ACTIVATION ENERGIES FOR CREEP, by John E. Dorn. Technical rept. no. 3 on Contract Nonr-222(49). 1 Aug 57, 48p. 51 refs. Series no. 103, issue no. 3; AD-143 668.
Order from LC mi$3.30, ph$7.80 PB 138 934

A few published results of creep determinations are reviewed, followed by a brief survey of more recent and unpublished data on activation energies for creep. Most of these activation energies were obtained by the special technique of ascertaining the effect of small abrupt changes in temperature on the creep rates for pure polycrystalline Al. Over the entire range of conditions that were investigated, the activation energy was insensitive to the applied stress, creep strain, and the sign of the temperature change. In all cases where the activation energies from reliable auxiliary data are compared with those obtained by the abrupt temperature change technique, the same values are obtained. This same technique was applied to single Al crystals to obtain activation energies. The temperature at which transitions from lower (3400 to 28,000 cal/mol) to higher activation energy processes took place at higher temperatures in single (octrahedral creep) crystals than in polycrystalline aggregates. Determinations of activation energy were made on single Al crystals oriented for cubic slips, and the results are compared with those from polycrystalline Al and single Al crystals oriented for octahedral slip. Metallographic examinations revealed that most of these crystals exhibited recrystallization. Activation energies for creep were also determined for a polycrystalline Al alloy containing 3.2 at-% Mg; from about 220° to about 400°K the activation energies were much greater than for pure Al. Delayed yielding is also discussed.

Notre Dame U., Ind.
ORDER-DISORDER TRANSFORMATIONS IN IRON-ALUMINUM ALLOYS, by H. J. McQueen and G. C. Kuczynski. Final rept. on Contract Nonr-1623(03). 1 May 58, 29p. 9 refs.
Order from LC mi$2.70, ph$4.80 PB 138 814

Alloys below 23 atom percent Al transform from disordered solution to ordered Fe_3Al structure; whereas those above 23 atom percent Al transform first to FeAl structure, and then to Fe_3Al structure. The transformation is one of nucleation and growth.

Souther, Henry, Engineering Co., Hartford, Conn.
DEVELOPMENT OF A TEST METHOD FOR DETERMINING THE CORROSION RESISTANCE OF PHOSPHATED COMPONENTS, by I. Laird Newell. Final rept. on Contract DA 19-059-ORD-1498. 10 Jan 56, 404p. 54 refs. AD-88 651.
Order from LC mi$11.10, ph$60.60 PB 142 914

A bibliography of the literature was prepared. In preparation of panels used in the test procedures. Both manganese and zinc base solutions were used, variations in the corrosion resistance of panels were obtained by exposing the panels to different treatment times in the phosphating baths. A total immersion test, using salt water, was developed which appeared to give reliable results in the testing of phosphate coatings. A proposed specification for corrosion testing of phosphate panels by means of immersion test has been written.

Springfield Armory, Mass.
EFFECT OF CRYSTALLINE STRUCTURE OF METALS ON RATIO OF STATIC TO DYNAMIC YIELD STRENGTH, by C. S. Frankowski and E. H. Abbe. Rept. on Exploratory Basic Ordnance Research. 15 Dec 58, 25p. 25 refs. Rept. SA-TR19-1210.
Order from LC mi$2.70, ph$4.80 PB 138 830

An investigation was conducted to study the feasibility of determining the influence of crystalline structure on ratio of yield strength of metals at low rates of loading and at high rates of loading. Procedure is described, and results are compiled and discussed.

Titanium Metallurgical Lab., Battelle Memorial Inst., Columbus, Ohio.
CORROSION OF TITANIUM AND TITANIUM ALLOYS IN LIQUID AND GASEOUS FLUORINE, by G. L. Ericson, W. K. Boyd, and P. D. Miller. 30 Apr 58, 7p. 6 refs.
Order from LC mi$1.80, ph$1.80 PB 138 763

Unalloyed titanium and four titanium-base alloys were subjected to a simple preliminary corrosion evaluation in liquid and gaseous fluorine at temperatures between -320 F and +220 F. All materials exhibit promising corrosion resistance under the test conditions.

Watertown Arsenal Labs., Mass.
CORRELATION OF THE FRACTURE APPEARANCE AND IMPACT PROPERTIES WITH THE MICRO-

STRUCTURE IN TITANIUM ALLOY 6%Al-4%V, by Harold G. Carter. Nov 57, 16p. 2 refs. WAL Technical rept. 401/292.
Order from LC mi$2.40, ph$3.30 PB 139 165

In the "as-cast" condition, the conchoidal, coarse granular-type of fracture having low impact strength was associated with the presence of a fine chain-like grain-boundary precipitate. Heat treatment nearly eliminated this grain-boundary precipitate. The fracture appearance changed from coarse granular to a mixture of crystalline and fibrous. The impact strength was markedly increased by heat treatment.

Watertown Arsenal Labs., Mass.
THE CRUCIFORM TEST FOR PLATE CRACKING SUSCEPTIBILITY, by L. E. Poteat and W. L. Warner. Dec 58, 27p. 9 refs. WAL Technical rept. 710/1081; AD-208 331.
Order from LC mi$2.70, ph$4.80 PB 138 791

The cruciform test to separate a weld crack-susceptible heat of armor steel from a non-crack-susceptible heat, is more sensitive to testing conditions (temperature, fit-up, plate size, etc) than it is to differences in degree of crack susceptibility of the base metal used.

NUCLEAR PHYSICS AND NUCLEAR CHEMISTRY

Institute of Theoretical Physics, Stanford U., Calif.
GRAVITATIONAL PROPERTIES OF ANTIMATTER, by L. I. Schiff. Technical note no. 1 on Contract AF 49(638)388. Dec 58, 23p. 18 refs. AFOSR TN-58-1062; AD-207 222.
Order from LC mi$2.70, ph$4.80 PB 142 898

It seems very likely that all particles and antiparticles have positive inertial and passive gravitational masses, and that the equivalence principle is valid at least to very great accuracy. The active gravitational masses of antiparticles are then unknown. However, gravitational separation of stable aggregations of matter and antimatter on a cosmological scale cannot then be achieved by assuming that they are negative, and the validity of Newton's third law would require that they be positive.

Naval Research Lab., Washington, D. C.
ENERGY PRODUCTION AND FUSION PRODUCTS FROM A THERMONUCLEAR PLASMA, by W. R. Faust and A. D. Anderson. 1 Sep 59, 38p. 2 refs. NRL rept. 5371.
Order from OTS $1.00 PB 151 851

With the aid of the NRL computer Narec, calculations have been made giving the ion concentrations, neutron emission, energy density, and temperature as a function of time in deuterium-tritium and pure deuterium plasmas raised initially to temperatures near the thermonuclear "ignition" temperatures. The initial conditions chosen for a dueterium-tritium mixture were temperatures of 3.0, 3.5, 4.0, 4.5, and 5.0 kev, with both the deuterium and tritium ion concentrations being $10^{18}/cm^3$. The set of initial conditions chosen for pure deuterium was 10^{18} ions/cm^3 and temperatures of 15, 20, 25, 30, 35, 40, and 45 kev. The tables and graphs resulting from these preliminary calculations, in which the problem was idealized and other simplifying assumptions made, indicate an "ignition" temperature for the deuterium tritium mixture somewhere between 3.0 and 3.5 kev and an "ignition" temperature for the pure deuterium between 15 and 20 kev.

Texas Nuclear Corp., Austin.
INTERACTION OF FAST NEUTRONS IN IRON, LEAD, OXYGEN, AND NITROGEN, by Norman A. Bostrom, Ira L. Morgan and others. Rept. for 15 Apr 57-31 Jan 59 on Contract AF 33(616)5111. Feb 59, 146p. 76 refs. WADC Technical rept. 59-31; AD-216 652.
Order from OTS $2.75 PB 161 039

An investigation of the interaction of fast neutrons in nitrogen, oxygen, iron, nickel, and lead has been made for various energies. In particular the following measurements have been made: (a) The angular distributions of the neutrons inelastically scattered from iron and lead for 3.67 Mev, 4.21 Mev, and 4.70 Mev neutrons, using a pulsed beam time-of-flight spectrometer. (b) The angular distributions of the neutrons non-elastically emitted by iron and lead due to the bombardment of these elements with 15.2 Mev neutrons. (c) The energy distributions of the neutrons scattered at 90° from iron and lead for 4.21 Mev neutrons. (d) The energy distributions of the neutrons emitted at 90° by iron and lead resulting from bombardment with 15.2 Mev neutrons. (e) Cross sections for the production of gamma rays emitted from iron, lead, nitrogen, and oxygen due to neutron interactions in the energy region from 3.2 Mev to 4.6 Mev and at 1.0 Mev, 7.5 Mev, and 14.9 Mev. (f) The angular distribution of the 0.845 Mev gamma ray from iron which results from inelastic neutron scattering at $E_n = 1.0$ Mev and 4.70 Mev. (g) The angular distribution of the 2.62 Mev gamma ray from lead at $E_n = 4.18$ Mev in the angular range from 50° to 90°. (h) The angular distribution of the gross gamma rays from iron and lead for incident neutron energies of 3.67 Mev, 4.21 Mev, and 4.70 Mev. (i) The angular distribution of the neutrons elastically scattered from iron and lead for 3.67 Mev, 4.21 Mev, and 4.70 Mev neutrons. (These results were not corrected for multiple scattering). (j) The activation cross section of nickel for thermal neutrons. (k) The cross section for the production of high energy gamma rays due to capture in nickel for neutrons in the energy range from 100 kev to 500 kev.

Western Reserve U., Cleveland, Ohio.
LOW-INTENSITY CONVERSION LINES IN TWO WEAKLY DEFORMED NUCLEI, by W. T. Achor, W. E. Phillips (Vanderbilt U.) and others. Rept. on Contracts AF 18(603)61, AT (40-1)268 and AT (40-1)1322. 12 May 59, 30p. 43 refs. AFOSR-TN-59-433; AD-214 795.
Order from LC mi$2.70, ph$4.80 PB 143 070

Elementary Particles

Ecole Normale Superieure (France)
ON THE CONNECTION BETWEEN THE S-MATRIX AND A CLASS OF NON-LOCAL INTERACTIONS, by Kh. Chadan. Technical note no. 11 on Contract AF 61(514)1060. [1959] 23p. 13 refs. AFOSR-TN-59-49; AD-209 420.
Order from LC mi$2.70, ph$4.80 PB 139 057

The problem of finding a phenomenological separable interaction from the S-matrix has been resolved by M. Gourdin and A. Martin who gave exact and explicit formulae relating the interaction to the phase-shift and bound state binding energy. We generalize their method to the case where the interaction is the superposition of a non-local separable interaction and a local one, both of them being central. The local part of the interaction is supposed to be known. We show how the separable part can be determined by the S-matrix. The main result is that, given the local part of the interaction, the phase-shift and the bound states binding energies, it is then possible to determine exactly the separable part of the interaction if the phase-shift has a good behaviour.

Institute for Fluid Dynamics and Applied Mathematics, U. of Maryland, College Park.
THE PAIR DISTRIBUTION FUNCTION OF A BOSE HARD SPHERE SYSTEM, CALCULATED TO THE FIRST ORDER OF THE SCATTERING LENGTH, by L. Colin and J. Peretti. Rept. on Contract AF 18(600)1315. July 59, 47p. 7 refs. Technical note BN-179; AFOSR TN-59-739.
Order from LC mi$3.30, ph$7.80 PB 142 990

Using the Binary Collision Expansion Method, we have derived the expression of the pair distribution function of a system of Bose particles interacting via a hard sphere potential of radius a, up to the first order in a/λ. To do so we have used a general formula relating the pair distribution function in the grand canonical ensemble to certain generalized cluster integrals. The evaluation of these cluster integrals up to the first order in a/λ is achieved by using the diagrammatical analysis of the cluster functions of the binary collision expansion method, which is equivalent to this order with the method of torons.

Institute of Mathematical Sciences, New York U., N. Y.
RELATIVISTIC COULOMB SCATTERING, by Bernard Rosen. Rept. on Contract AF 19(604)4555. Apr 59, 69p. 96 refs. Research rept. no. CX-42; AFCRC TN-59-293; AD-215 933.
Order from LC mi$3.90, ph$10.80 PB 143 202

Maryland U., College Park.
COLLISIONAL AUGER PROCESS FOR Mu-MESIC ATOMS, by T. B. Day and J. Sucher. Rept. on Contract AF 49(638)24. July 59, 8p. 5 refs.
Physics Dept. Technical rept. no. 143; AFOSR TN-59-771.
Order from LC mi$1.80, ph$1.80 PB 143 157

Nepa Div., Fairchild Engine and Airplane Corp., Oak Ridge, Tenn.
PROPOSED TECHNIQUE FOR MEASURING NEUTRON INELASTIC SCATTERING LEVELS, by Joe Keagy Bair. 12 Jan 50, 3p. 2 refs. NEPA 1260 SER-7; AD-206 721.
Order from LC mi$1.80, ph$1.80 PB 138 942

Sarah Mellon Scaife Radiation Lab., U. of Pittsburgh, Pa.
RESEARCH ON THE PHYSICAL PROPERTIES OF PHOTONS, ELECTRONS AND POSITRONS, by L. A. Page and F. E. Obenshain. Final rept. for 1 Nov 56-31 Oct 58 on Contract DA 36-061-ORD-559. [1958] 57p. 42 refs. AD-210 568.
Order from LC mi$3.60, ph$9.30 PB 143 090

Instruments and Installations

Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
AN ANALYSIS OF THE REQUIREMENTS FOR LARGE-VOLUME, HIGH-INTENSITY, GAMMA ENVIRONMENTAL TESTING FACILITIES, by Robert T. Carpenter and David M. Ericson. Master's thesis. Mar 59, 133p. 78 refs. GNE-59-3.
Order from LC mi$6.90, ph$21.30 PB 142 502

The applications of large-volume, high-intensity, gamma environmental testing facilities are discussed from the standpoint of developmental testing as well as radiation effects research. The non-nuclear requirements of such a facility are given with an emphasis on reproducing anticipated operating conditions. The nuclear parameters of the gamma radiation field which must be considered during radiation effects studies are discussed. An evaluation of present gamma facilities against the ultimate requirements of this study is presented.

Naval Ordnance Test Station, China Lake, Calif.
A METHOD FOR MEASURING EFFECTIVE ENERGY FROM RADIATION SOURCES, by H. I. Sumnicht. 10 Mar 58, 15p. NOTS-1979; NAVORD rept. 5861.
Order from LC mi$2.40, ph$3.30 PB 139 301

A basic problem encountered in the use of radiation detectors is that of determining quantitatively the degree to which a source will effect a response in a detector whose response curve shows spectral variation. Often the curves showing the spectral distribution of the power source and the spectral variation of the detector response are not available. This report therefore describes a method whereby the unknown radiation source is evaluated by comparing it with a source of known power distribution.

Nuclear Engineering and Power

TENTATIVE STRUCTURAL DESIGN BASIS FOR REACTOR PRESSURE VESSELS AND DIRECTLY ASSOCIATED COMPONENTS (PRESSURIZED, WATER COOLER SYSTEMS). Revision 1 Dec 58, with Addendum no. 1, 27 Feb 59, 162p.
Order from OTS $3.00 PB 151 987

Contents:
General structural requirements
Materials data
Stress limits
Detailed structural requirements
Inspections and tests
Installation and operating precautions
Stress criteria and calculations
Basis for establishing allowable stresses
Compensation for openings
Thermal strain ratchet
Basic bibliography on thermal stress analysis

Convair, Fort Worth, Tex.
ARMY EXPEDIENT SHIELD PROGRAM: A PLANNING STUDY. Rept. on Contract DA 44-192-eng-2. 13 Feb 59, 57p. 44 refs. FZK-112.
Order from I C mi$3.60, ph$9.30 PB 143 056

The field expedient shielding program has as its purpose the acquisition of information to permit the expeditious construction of secondary shields around nuclear reactor power plants using only site-available materials. This report presents the effort required to produce this information in the form of an Expedient Shield Design Manual.

Fairchild Engine Div., Deer Park, N. Y.
A DIRECT NUCLEAR ELECTROGENERATOR: ANALYSIS OF CYLINDRICAL ELECTRODE CONFIGURATION, by Alfred Schock. Rept. on Contract AF 49(638)15. 15 June 59, 143p. 14 refs. AFOSR TN-59-590; AD-216 812.
Order from OTS $2.75 PB 151 989

A system for the direct conversion of nuclear fission energy to high voltage electricity is examined. The system is based on the motion of highly charged fission fragments counter to a strong electric field. In this manner, part of the fragments' kinetic energy is converted into potential (electric) energy. The superiority of cylindrical over plane electrodes is explained, and the effect of various geometric and operating variables on system performance is analyzed. For various conditions, it is possible to achieve conversion efficiencies up to 13%, electric power densities up to 4.5 megawatts per cubic meter of reactor core, and neutron multiplication factors up to 2.1. However, these three performance parameters are shown to be mutually interdependent, and the choice of a design point must represent a compromise between their respective maximization. The optimum design parameters will depend on the intended application of the system.

Naval Ordnance Lab., Corona, Calif.
PERFORMANCE OF SOLID STATE MATERIALS AND DEVICES SUBJECT TO A NUCLEAR RADIATION FLUX, by H. H. Wieder. 6 Aug 57, 28p. 58 refs. NOLC rept. 374; NAVORD rept. 4621; AD-143 467.
Order from LC mi$2.70, ph$4.80 PB 143 043

Solid state materials and components have been evaluated with respect to changes in their electrical characteristics brought about by a nuclear radiation flux. The effects of nuclear radiation are strongest when the physical properties of the solid depend upon large scale order in the crystalline lattice or when the type, quantity, and arrangement of impurities within the solid are of prime importance. Calculations indicate that the radiation flux to be expected from a reactor used for powering a large missile or airplane would be on the order of, and probably less than 10^{11} neutrons/cm^2. Most solid state devices and materials perform satisfactorily at this dosage. In general, metals, dielectrics, piezoelectrics, and ferroelectrics show only small radiation damage for dosages below 10^{15} neutrons/cm^2. Semiconductors, however, are affected strongly by neutron- and γ-flux fields.

Nuclear Reactions

Ecole Normale Superieure (France).
ON THE NUCLEON-ANTINUCLEON INTERACTIONS, by M. Gourdin, B. Jancovici, and L. Verlet. Technical note no. 10 on Contract AF 61(514)1060. 1958 15p. 12 refs. AFOSR-TN-58-386; AD-154 293.
Order from LC mi$2.40, ph$3.30 PB 138 753

The nucleon-antinucleon cross-sections at 167 MeV have been computed with two complex potential well models. Yukawa shaped complex wells were first studied in Born approximation. A semi-theoretical potential has then been analysed on the digital computer IBM 704: the real part is the Signell and Marshak potential, adapted to the nucleon-antinucleon problem, and the imaginary part, a Yukawa phenomenological well. In order to account for the experimental results (large total cross-section and small scattering cross-section), it appears necessary to choose a weak real potential and an imaginary potential having a range at least equal to the usual nuclear force range. The fixed source meson theory leads to a real potential, which is much too strong and does not predict an imaginary potential at all; this theory cannot account for the experimental results.

Pittsburgh U., Pa.
CHARGE TRANSFER FOR PROTONS IN H_2, by R. Curran, T. M. Donahue, and W. H. Kasner. Technical rept. no. 7 on Capture-Loss and Ionization Cross-Sections of Ions and Neutral Particles, Contract Nonr-624(06). Oct 58, 24p. 30 refs.
Order from LC mi$2.70, ph$4.80 PB 143 221

A precise measurement of the electron capture cross section for protons in H_2 is reported for proton energies between 2.4 and 60 Kev. It involves collection of the residual ions by a sequence of identical

condensers. The same scattering chamber is also used for the measurement of σ_{01} and $(\sigma_{01}+\sigma_{10})$.

Radioactivity

[Army Chemical Warfare Labs.] Army Chemical Center, Md.
THE PROPER ROLE OF DETERGENTS IN RELATION TO RADIOLOGICAL DECONTAMINATION, by Harry Levin. 5 Feb 51, declassified 17 July 59, 14p. 17 refs. Technical Command interim rept. 627.
Order from LC mi$2.40, ph$3.30 PB 143 500

Certain considerations in regard to six detergents in particular and detergency in general are presented that may aid in the development of detergents and afford a realization of the complexity of decontamination problems as well as an insight into the mechanisms of detergency. Advantages and limitations of the six detergents are discussed.

Laboratory for Nuclear Science, Mass. Inst. of Tech, Cambridge.
MEASUREMENTS OF GAMMA RAY ABSORPTION COEFFICIENTS, by Charlotte Meaker Davisson and Robert D. Evans. Technical rept. no. 37 on Contract N5ori-07806. 1 Feb 50, 55p. 76 refs.
Order from LC mi$2.60, ph$9.30 PB 143 436

The absorption of γ-rays in Al, Cu, Sn, Ta, and Pb was measured by use of γ-rays from I^{131}, Cu^{64}, Mn^{54}, Co^{60}, Zn^{65}, and Na^{24}. Tests showed that scattering from nearby objects and from the absorber were negligible. Tests of the absorption of radium γ-rays in Pb showed good agreement with other workers and with theory. The absorption curves of I^{131} showed the presence of a 0.65 Mev γ-ray about 15 per cent as abundant as the 0.367 Mev γ-ray. Absorption coefficients measured with the other sources showed agreement within 0.5 per cent to 2 per cent with theory. An anomalous absorption coefficient (5 per cent less than expected) with tantalum absorber ($Z = 73$) and Zn^{65} and Co^{60} sources ($h\nu \sim 1.2$ Mev) needs re-investigation.

Sarah Mellon Scaife Radiation Lab., U. of Pittsburgh, Pa.
RADIATION DAMAGE STUDY. Rept. no. 3 for Aug-Sep 52 on Contract DA 18-108-cml-3429. [1952] 7p.
Order from LC mi$1.80, ph$1.80 PB 143 537

This report notes the progress made towards dosage determinations.

PERSONNEL SUPPLIES AND PERSONAL EQUIPMENT

Aero Medical Lab., Wright Air Development Center, Wright-Patterson AFB, Ohio.
DESIGN OF VENTILATED CLOTHING, by Paul Webb and F. K. Klemm. Rept. on Air Conditioned Anti-Exposure Suit, Mar 59, 22p. 7 refs. WADC Technical rept. 58-608; AD-213 602.
Order from OTS $0.75 PB 151 874

The purpose of ventilation of clothing is reviewed and the functions of convective and evaporative cooling are described. How to achieve these functions is discussed in detail by describing the principles of proper air distribution, effective evaporation, and full utilization of convective cooling in ventilated clothing assemblies. A description of various ventilating garments is given to illustrate the evolution of principles, and, finally, an "ideal" ventilating system is defined for the difficult problem of ventilated pressure suit assemblies. Tests are described which demonstrate the validity of employing each of the design principles which go into the "ideal" system. The general subjects of low energy ventilating systems and of integration of ventilated clothing assemblies are discussed. Recommendations are made concerning the use and design of ventilation systems for protective clothing.

Berger Brothers Co., New Haven, Conn.
HIGH-ALTITUDE, PARTIAL PRESSURE SUITS DESIGNED WITH DOUBLE CAPSTANS, VENTILATION LAYERS, AND PARTIAL PRESSURE AND FULL PRESSURE SOCKS, by Fred D. Moller. Rept. for Feb 57-May 58 on Pressure Suits and Accessories, Contract AF 33(616)3904. June 59, 17p. WADC Technical rept. 59-246.
Order from OTS $0.50 PB 161 053

This report deals with the resizing of the Type MC-4 suit (partial pressure, high-altitude, with g-bladder protection) to meet fitting requirements when selection is made by "Stature-Weight" selection charts. The resized suit is known as Type MC-4A. The design and construction of three prototypes of partial pressure suits having various features requiring evaluation in the effort to overcome certain problem areas are discussed. The development of pneumatic socks (both partial pressure and full pressure) for pressurizing the feet is also discussed.

Quartermaster Research and Engineering Center, Natick, Mass.
THE PHYSIOLOGY OF LOAD-CARRYING XII. THE USE OF STRAP PRESSURE AS A CRITERION FOR EVALUATING ARMY COMBAT PACKS, by Lora M. Ewing, Peter V. Karpovich and Creighton J. Hale (Springfield Coll.). Oct 57, 21p. 3 refs. Technical rept. EP-69.
Order from LC mi$2.70, ph$4.80 PB 139 012

Measurements were taken of the pressure exerted by the straps of five different military packs on both the front and the top of the shoulders of 26 young men. Pressures were taken before, during, and after a walk by subjects on a treadmill. A technique was devised for measuring the area of contact between the strap and the chamber of a pressure meter, so that total pressure (in pounds) could be converted into pressure per unit area (in pounds per square inch). Results showed that the straps of the U. S. Experimental Pact T53-8 exerted the lowest pressure per unit area on both the top and front of the shoulders. This pack also registered the lowest total pressure on the front of the shoulder, whereas the British Experimental Pack UK-Z2 had the lowest total pressure on the top of the shoulders. The packboard produced the highest pressures, both total and per unit area. (See also PB 124 856)

Quartermaster Research and Engineering Center, Natick, Mass.
THE PHYSIOLOGY OF LOAD-CARRYING XIII. PERFORMANCE TESTS FOR THE EVALUATION OF ARMY COMBAT PACKS, by Creighton J. Hale and Peter V. Karpovich (Springfield Coll.). Oct 57, 22p. 4 refs. Technical rept. EP-70.
Order from LC mi$2.70, ph$4.80 PB 139 013

A study was made to evaluate the effect of 3 different Army packs upon the performance of selected physical activities comparable to those required of Infantrymen in combat. Twelve performance tests were performed by 24 men in the evaluation of the U. S. Standard, U. S. Experimental T53-8, and British Experimental UK-Z2 combat packs. Tests performed with each pack and without a pack were: running, creeping, rolling, jumping, climbing, throwing, falling (hitting the dirt), getting up from the ground, changing direction, agility, and balance. Time of performance and reaction time were measured in all tests. In practically all cases, results showed performances without a pack were better than with a pack. Exceptions were: (1) Creeping I was performed as rapidly with any of the three packs as without a pack, (2) Throwing (grenades) was as accurate while carrying the U. S. Experimental Pack as without a pack, (3) Falling (hitting the dirt) was performed as rapidly while carrying the U. S. Experimental and U. S. Standard packs as without a pack, and (4) Balance was maintained equally well with the U. S. Experimental pack as when no pack was worn. Grenade throwing when carrying the U. S. Experimental pack was more accurate than when carrying the U. S. Standard pack of the British Experimental pack. There was no difference in reaction time with or without a pack.

PHYSICS

Stanford Research Inst., Menlo Park, Calif.
RESEARCH ON THE EFFECTS OF NUCLEAR RADIATION ON DIELECTRICS AND MAGNETICS, by S. I. Taimuty and C. A. Rosen. Scientific rept. no. 1, July-Sep 58, on Contract AF 19(604)4141. 31 Oct 58, 14p. 19 refs. AFCRC-TN-58-572; AD-160 886.
Order from LC mi$2.40, ph$3.30 PB 138 723

Preliminary results of a survey of the literature on the effects of nuclear radiation on magnetic alloys, ferrites, ferroelectric materials, and quartz are presented. The most marked changes produced by radiation occur in structure-sensitive properties, suggesting changes in the degree of order in the material. The characteristics of a magnetic hysteresigraph for use with toroids at frequencies up to 100 kc are described.

Acoustics

California U., Los Angeles.
THE NORMAL MODES OF A PRESSURE RELEASE SPHEROIDAL ENCLOSURE, by E. Lax and R. W. Leonard. Technical rept. no. 10 on Contract Nonr-233(48). Apr 58, 16p. 5 refs.
Order from LC mi$2.40, ph$3.30 PB 142 941

An experimental method of determining the frequencies of the normal modes of a spheroidal volume with a pressure release surface has been devised. Water filled plastic envelopes, constrained to spheroidal shapes by a series of sharp edged rings, were excited acoustically and the frequencies of the normal modes were measured.

Physical Metallurgy Lab., Calif. Inst. of Tech., Pasadena.
EXACT SOLUTION OF LONGITUDINAL ACOUSTIC WAVES PROPAGATING ALONG AN ANISOTROPIC CYLINDER, by Edward A. Stern. Technical rept. no. 2 on Contract AF 18(600)1561. Jan 59, 17p. 5 refs. AFOSR TN-58-1053; AD-206 981.
Order from LC mi$2.40, ph$3.30 PB 139 150

Exact solutions are obtained for the problem of axially symmetric longitudinal elastic waves propagating along a cylinder composed of a hexagonal crystal whose c-axis is along the cylinder axis. It is shown that the solutions for this particular anisotropic case have qualitatively the same type of modes of propagation as in the isotropic case of the Pochhammer-Chree solutions. Good agreement between theory and experiment is obtained for the velocity as a function of wavelength.

Underwater Sound Reference Lab., Orlando, Fla.
A HYDROPHONE CALIBRATION SYSTEM FOR LOW FREQUENCIES AND HIGH STATIC PRESSURES, by Louis G. Beatty. 17 Dec 58, 25p. 6 refs. USRL Research rept. 41.
Order from LC mi$2.70, ph$4.80 PB 139 079

A system that has been developed for making both absolute and comparison calibration measurements on pressure-sensitive hydrophones in the low sonic and infrasonic frequency ranges (0.3 to 500 cps) at various static pressures up to 1000 psig is described.

The theory of some bounded medium calibrations and some of the ways in which practical systems depart from the ideal are discussed.

Electricity and Magnetism

Geophysical Inst., U. of Alaska, College.
AN INVESTIGATION OF WHISTLERS AND CHORUS AT HIGH LATITUDES, by J. H. Pope. Scientific rept. no. 4 on Contract AF 19(604)1859. Apr 59, 42p. 10 refs. AFCRC TN-[59-]355; AD-216 522.
Order from LC mi$3.30, ph$7.80 PB 142 997

The whistlers and chorus received at College, Alaska during the period from December 1955 through March 1958 are studied particularly with respect to temporal variations. The diurnal curves for whistler activity show maxima after midnight local time while the seasonal variation peaks during the winter. It appears that these variations in whistler activity are in part explainable in terms of very low frequency propagation conditions. The diurnal variation of chorus shows a maximum at about 1400 hours local time. By the use of data from lower latitude stations a dependence of this time of diurnal maximum on the geomagnetic latitude of the station is shown. The coefficients of correlation for chorus activity versus magnetic activity were determined on a monthly basis. A seasonal variation in these correlations is indicated which appears to be unique for the geomagnetic latitude of College. A preliminary statistical study of one of the more easily measured characteristics of chorus is discussed. The characteristic chosen is the mid-frequency in an element of chorus. A diurnal variation in this parameter is indicated.

Technical Research Group, New York.
NUCLEAR RESONANCE FILTERS FOR RADAR AND COMMUNICATIONS APPLICATIONS, by R. T. Daly and M. Newstein. Quarterly progress rept. no. 4, 1 Apr-15 June 57, on Contract DA 36-039-sc-72408. [1957] 40p. 6 refs. AD-139 102.
Order from LC mi$3.00, ph$6.30 PB 139 059

A linear approximation has permitted an explanation of the spurious signal observed at the filter output when only shimming pulses are applied. Two experimental limitations are found to cause an unstable condition in the spin moment configuration. The first of these is a small departure of the shimming pulse rotation from 180°. The second is dispersion of spin moments during the finite shimming pulse. Quantitative expressions for the spurious signal amplitude versus time and number of preceding pulses is given and compared with the photographic record of the experiment. An extension of the "guided flux" type of crossed coil mount is proposed to overcome mechanical stability limitations of the present structure.

Electronics

Antenna Lab., Calif. Inst. of Tech., Pasadena.
ASYMMETRICALLY EXCITED ELECTROMAGNETIC RADIATION FROM CIRCULAR CYLINDERS OF FINITE LENGTH AND PROLATE SPHEROIDS, by Hans H. Kuehl. Technical rept. no. 19 on Contract AF 18(600)1113. June 59, 117p. 24 refs. AFOSR-TN-59-595; AD-217 182.
Order from LC mi$6.00, ph$18.30 PB 143 154

The far zone radiation from two types of asymmetrically excited systems is considered. The first is a finite cylinder excited by an electric dipole in the radial direction near the cylinder. The second is a prolate spheroid excited by a narrow belt of electric field around the surface of the spheroid. In both cases the body considered is perfectly conducting and the excitation is not necessarily centered at the midplane of the body. In the case of the finite cylinder excited by a radial dipole, an approximate method is used in which the current on the finite cylinder is taken to be identical with the current which would exist on an infinite cylinder under the same excitation. This approximation is shown to be valid analytically and experimentally if the cylinder is not short. The analytic and experimental results are compared for two cylinder lengths.

Army Signal Research and Development Lab., Fort Monmouth, N. J.
PROCEEDINGS OF THE ANNUAL SYMPOSIUM ON FREQUENCY CONTROL NO. 12, 6, 7, 8 May 1958, ASBURY PARK, N. J. 13 Aug 58, 674p. 94 refs.
Order from LC mi$11.10, ph$92.10 PB 142 945

Contents:
Piezoelectric resonators
Fundamental properties and synthesis of quartz
High precision crystals and crystal standards
New crystal developments
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Dalmo Victor Co., Belmont, Calif.
THEORETICAL AND EXPERIMENTAL INVESTIGATIONS TO DEVISE METHODS FOR OBTAINING DYNAMIC PATTERN DATA FOR ANTENNA SYSTEMS, by Robert W. Thille and Clarence A. Andrews. Scientific rept. on Contract AF 19(604)2637. 20 May 59, 14p. AFCRC-TN-59-359; AD-216 762.
Order from LC mi$2.40, ph$3.30 PB 142 803

The program is concerned with the evaluation of the characteristics of large scale antenna systems in an operational environment. The evaluation is made with respect to the goals of the mission to which the antenna systems are assigned and with respect to the environment within which these goals are to be achieved. This report summarized the types of effort expended in the U. S. A. toward one segment of this problem, i. e., the patterning of large scale antenna systems. The major problem areas evident in the evaluation of any antenna system are discussed and a method of evaluating the particular test vehicle assigned to this initial study is described.

Electrical Engineering Research Lab., U. of Texas, Austin.
MEASURED RAIN ATTENUATION OF 4.3 MILLIMETER WAVELENGTH RADIO SIGNALS, by C. W. Tolbert and J. R. Gerhardt. Rept. on Contract Nonr-375(07). 31 May 56, 27p. 7 refs. Rept. no. 83; AD-110 918.
Order from LC mi$2 70, ph$4.80 PB 143 211

This report will be concerned with the results of a series of attenuation measurements made at 4.3 millimeters wavelength over a 1000 foot path from November 1955 through April 1956. Coordinated rainfall rates and drop size distributions were measured for correlation with the path transmission characteristics.

Electronics Research Lab., U. of California, Berkeley.
INPUT-OUTPUT RELATIONSHIPS FOR MULTI-SAMPLED-LOOP SYSTEMS, by George G. Lendaris and E. I. Jury. Rept. on Contract AF 18(600)1521. 3 Dec 58, 36p. 13 refs. IER Series no. 60, issue no. 214; AFOSR-TN-58-813; AD-202 358.
Order from LC mi$3.00, ph$6.30 PB 138 741

A general gain expression for a multi-sampled-loop sampled-data system is proposed, and an extended table of systems to which this gain expression has been applied is presented.

General Electric Co., Schenectady, N. Y.
INVESTIGATION OF VARIOUS ACTIVATOR-REFRACTORY SUBSTRATE COMBINATIONS, by N. J. Hawkins and J. H. Affleck. Scientific rept. no. 2 on Contract AF 19(604)4093. 22 Dec 58, 21p. 4 refs. AFCRC-TN-59-104; AD-208 329.
Order from LC mi$2.70, ph$4.80 PB 138 739

Theoretical effort was continued in further study of the Langmuir approach to an all inclusive relation between electron emission and activator evaporation rate. In particular a calculation was set up to correct the equations for the presence of adsorbed electrically neutral cesium atoms which are present along with the positively charged ions in the cesium on tungsten system. The thermionic constants are being determined for the refractory salts prior to the addition of activator elements. Initial measurements found that molybdenum silicide had a work function of 4.7 ev at 1650°K. At a higher temperature silicon is evaporated from the emitter, resulting in a drop of the work function.

Little, Arthur D., Inc., Cambridge, Mass.
INVESTIGATION AND EVALUATION OF VARIOUS PROCESSES IN SOLID STATE AND GASEOUS ELECTRONICS. PART I. CRYSTAL-GROWTH PROCESSES AND A DESIGN STUDY FOR A CRYSTAL-GROWTH FACILITY. Final rept., Pt. 1, on Contract AF 19(604)4116. 30 June 59, 143p. 48 refs. AFCRC TR-59-161, Pt. 1; AD-217 853.
Order from OTS $2.75 PB 161 009

Several crystal-growing laboratories were visited and the current literature surveyed. On the basis of the information found and background previously obtained, a discussion of crystal-growing methods is presented. Laboratory layouts and service requirements for the proposed Crystal Physics facility of the Air Force Cambridge Research Center have been developed and are included in the appendix. These layouts are based on the architecht's drawings of the proposed facility and reflect comments of Air Force Cambridge Research Center technical personnel and the findings of this survey.

Little, Arthur D., Inc., Cambridge, Mass.
INVESTIGATION AND EVALUATION OF VARIOUS PROCESSES IN SOLID STATE AND GASEOUS ELECTRONICS. PART II. GASEOUS-PLASMA PHYSICS. Final rept. Pt. 2, on Contract AF 19(604)4116. 30 June 59, 105p. 157 refs. AFCRC TR-59-161, Pt. 2; AD-217 853.
Order from OTS $2.50 PB 161 011

The purpose of the work reported here was to review and evaluate the research methods and equipment in the field of gaseous electronics and plasma physics and to provide technical background for the planning of a research facility for this type of work. Since the entire field of gaseous electronics and plasma physics is very broad and has many ramifications that are outside the mission of the planned facility, our survey was deliberately focused upon only a few selected areas, such as methods of measurement, special research equipment, and the generation of very high temperatures. These subjects are comprehensively reviewed in the appropriate sections of this report. (See also PB 161 009)

Miami U., Coral Gables.
STUDIES OF ELECTRON ENERGY BANDS, by Joseph Callaway. Final technical rept. on Contract AF 49(638)62. June 58, 15p. 19 refs. [AFOSR] TR-58-98; AD-162 172.
Order from LC mi$2.40, ph$3.30 PB 138 987

Microwave Engineering Labs., Inc., Palo Alto, Calif.
TRANSITION PROBABILITIES INDUCED BY PLANE POLARIZED ELECTROMAGNETIC RADIATION, by James H. Burgess. Rept. on Contract AF 19(604)4071. 15 Apr 59, 24p. 8 refs. MELabs Technical rept. no. 2-8-1; AFCRC-TN-59-186; AD-215 063.
Order from LC mi$2.70, ph$4.80 PB 142 812

Microwave Lab., Stanford U., Calif.
SUMMARY OF ELECTRON VELOCITY SPECTROGRAPH PROJECT, by P. B. Wilson. Scientific rept. no. 11 on Contract AF 19(604)1930. May 59, 56p. 9 refs. M. L. rept. no. 572; AFCRC-TN-59-356; AD-216 521.
Order from LC mi$3.60, ph$9.30 PB 143 207

Experimental results are presented which were obtained from the use of a cross-field electron velocity spectrograph. An analysis of the velocity distribution of the electrons is given for a 10 kv, modulated, magnetically-focused, pulsed electron beam of microperveance 1. The electron beam is studied under several different conditions: with and without rf modulation present; and at two different drift lengths. Much of the experimental information is presented in the form of graphs.

Oxford U. (Gt. Brit).
RADIATION OF AN ELECTRON IN AN INFINITELY LONG WAVEGUIDE, by H. Motz and M. Nakamura. Technical note no. 2 on Contract AF 61(514)1183. Oct 58, 57p. 9 refs. AFOSR TN-59-43; AD-209 215.
Order from LC mi$3.00, ph$9.30 PB 139 104

This chapter deals with the electromagnetic fields excited by a single electron with prescribed motion in an infinitely long cylindrical space surrounded by perfectly conducting walls, and filled with a uniform linear medium. The medium is assumed to be lossy in order to avoid complexities arising from the radiation condition. The problem is attacked by first obtaining a general expression for the electric Hertz vector. From this Hertz vector the electric fields are calculated for (1) uniform motion of the electron parallel to the axis of a wave-guide of arbitrary cross section (2) uniform but longitudinally oscillatory motion and (3) undulating motion with constant velocity parallel to the axis of a rectangular wave-guide.

Rome Air Development Center, Griffiss AFB, N. Y.
THE DISTRIBUTION FUNCTION OF THE SUM OF TWO INDEPENDENT RAYLEIGH VARIABLES WITH UNEQUAL MEDIANS, by Alfred S. Kobos. June 59, 44p. 13 refs. RADC TN-59-118; AD-213 891.
Order from LC mi$3.30, ph$7.80 PB 142 946

This report develops an exact solution for the reliability of a linear sum of two random variables whose amplitudes are Rayleigh-distributed, but whose median values are not equal. A discussion of the correlation between signals is presented, using the notation of set algebra. Methods are also discussed for the solution of signal combination problems in communications, with only the statistical functions available. The result developed has an application to equal-gain diversity combiner performance in tropospheric scatter systems, when the signal envelope amplitude distributions on two channels are represented by different medians.

British Columbia U. (Canada).
THE IONIZATION AND DISSOCIATION OF SOME HALOGEN MOLECULES BY ELECTRON IMPACT, by D. C. Frost and C. A. McDowell. Scientific rept. no. 2 on Contract AF 19(604)2275. Aug 59, 37p. 22 refs. AFCRC-TN-59-442.
Order from LC mi$3.00, ph$6.30 PB 143 194

Modern electron impact methods which use monoenergetic electron sources can provide much information concerning the excited states of molecular ions. The retarding potential difference (R.P.D.) method to obtain essentially monoenergetic electrons was applied. The molecules studied are chlorine, bromine, iodine, iodine monochloride and iodine monobromide.

Hawaii Inst. of Geophysics [Honolulu].
PHOTOIONIZATION COUNTER FOR THE VACUUM ULTRAVIOLET, by K. Watanabe, H. Sakai, and K. Griswold. Scientific rept. no. 3 on Contract AF 19(604)1390. [1958] 43p. 28 refs. Contribution no. 10; AFCRC-TN-58-655.
Order from LC mi$3.30, ph$7.80 PB 139 474

An exploratory study was made to determine the feasibility of applying gas-multiplication techniques to high resolution ultraviolet photometry. Two types of detectors were investigated: (1) gas-multiplication ion chamber operating in the proportional region and (2) photoionization counter operating in the Geiger region. All gases studied were amenable to both methods. The first type of detector had a gain in sensitivity of 10^4 over that of an ion chamber, and its response was found to be linear with intensity. The ionization continua of several molecules were studied with this detector. The second type of detector was capable of detecting about 10 photons per second when nitric oxide was used as the ionizing gas. The ionization potentials determined by this technique were 9.245 ev for nitric oxide, 10.075 ev for CS_2, and 9.067 ev for 1,3-butadiene. Furthermore, fine structures due to vibrational levels were observed in the ionization continua.

Institute for Fluid Dynamics and Applied Mathematics, U. of Maryland, College Park.
TENSOR FORMALISM FOR COULOMB INTERACTIONS AND ASYMPTOTIC PROPERTIES OF MULTIPOLE EXPANSIONS, by Laurens Jansen. Rept. on Contract AF 18(600)1315. Oct 57, 41p. 26 refs. AFOSR TN-57-698; AD-136 691.
Order from LC mi$3.30, ph$7.80 PB 139 2[illegible]8

A tensor notation for electric multipole interactions between molecular charge distributions is developed and applied to the evaluation of first and second order interaction energies. An equivalence theorem between cylindrically symmetric and linear assemblies of charge is established. The mathematical implications of using a multipole Taylor expansion in regions of configuration space where the series has no validity is discussed for the first and second orders of perturbation theory.

Institute of Mathematical Sciences, New York U., N. Y.
THE APPLICATION OF WAVE FUNCTIONS CONTAINING INTERELECTRON COORDINATES. I. THE GROUND STATE ENERGY OF LITHIUM, by Peter Walsh and Sidney Borowitz. Rept. on Contract AF 19(604)4555. Apr 59, 61p. 12 refs. Research rept. no. CX-41; AFCRC-TN-59-252; AD-217 189.
Order from LC mi$3.90, ph$10.80 PB 142 836

Description of atomic systems by the method of introducing interelectron coordinates explicitly. The simplest atomic systems, helium and lithium, are treated and excellent results are found in calculating the energy values of the corresponding ground states. In addition, an approximation technique of high accuracy has been developed to handle, mathematically, wave functions containing many interelectron coordinates.

Mallinckrodt Chemical Lab., Harvard U., Cambridge, Mass.
A STARK-EFFECT, RESONANT CAVITY MICROWAVE SPECTROGRAPH, by Peter H. Verdier. Rept. on Contract N5onr-1866, T.O. 14. [1958] 7p. 8 refs.
Order from LC mi$1.80, ph$1.80 PB 139 367

A K-band microwave spectrograph is described which employs a Stark-modulated resonant cavity as an absorption cell. The cavity is in the form of a circular cylinder of variable length, operating in the TE_{01p} modes. The modulating field is parallel to the cylinder axis, and is sufficiently uniform to permit the resolution of Stark components. The sensitivity of the cavity spectrograph is comparable with that of a waveguide spectrograph.

Massachusetts Inst. of Tech., Cambridge.
SOLID-STATE AND MOLECULAR THEORY GROUP. Quarterly progress rept. no. 30 on Contract Nonr-1841(34). 15 Oct 58, 73p. 6 refs.
Order from LC mi$4.50, ph$12.30 PB 143 224

Contents:
A method of treating zeeman splittings of paramagnetic ions in crystalline fields
Auxiliary computer techniques
Abstracts of programming notes
Programs for evaluation of molecular integrals
Multi-Center integral programs for I.B.M. 704 computer
I.B.M. 704 program for generating the irreducible representations of the group of spin coordinate permutations
Energy bands in potassium
Energy bands in iron
Energy bands in Wurtzite structures
Compton scattering of X-rays
Spin-orbit coupling constant in the simple diatomic molecules
Electronic wave functions for polyatomic molecules
Interaction of a hole with mobile lattice ions in KCl
(See also PB 140 592)

Mellon Inst. [of Industrial Research, U. of Pittsburgh, Pa.]
HIGH RESOLUTION INFRARED SPECTROSCOPY OF SOLIDS: INTERMOLECULAR INTERACTIONS IN THE SOLID STATE; EXTENT OF FREEDOM OF ROTATIONAL MOTION OF SMALL MOLECULES, by R. M. Hexter and D. E. Milligan. Rept. on Contract AF 49(638)542. 1 June 59, 27p. 12 refs. AFOSR [TN]-59-569; AD-217 003.
Order from LC mi$2.70, ph$4.80 PB 143 010

Michigan U. Coll. of Literature, Science, and the Arts, Ann Arbor.
HIGH RESOLUTION ELECTRIC FIELD INDUCED INFRARED ABSORPTION SPECTRA OF H_2 AND D_2, by C. H. Church. Technical rept. no. 1 on Contract AF 19(604)2071. Jan 59, 98p. 46 refs. 2609-3-T; AFCRC TN-59-237; AD-211 110.
Order from LC mi$5.40, ph$15.30 PB 143 203

Optics

Armour Research Foundation, Chicago, Ill.
A STUDY OF THE PARTICLE SIZE DISTRIBUTIONS OF AEROSOLS FROM LIGHT SCATTERING MEASUREMENTS. Final rept. for 15 May 55-14 Nov 56 on Contract AF 19(604)1428. 13 Nov 56, 87p.
Order from LC mi$4.80, ph$13.80 PB 139 270

A critical inquiry into the general problem of calculating the particle size distribution of a polydisperse aerosol from light scattering measurements alone is presented. (See also PB 126 727)

Hebrew U. (Israel).
THE GERMANIUM CuKα (2, 2, 2) DOUBLE X-RAY REFLECTIONS. I. INDEXATION, by E. Alexander, B. S. Fraenkel, and Z. H. Kalman. Technical rept. no. 1 on Contract AF 61(052)222. Apr 59, 18p. 3 refs. AFOSR TN-59-625; AD-217 689.
Order from LC mi$2.40, ph$3.30 PB 143 013

A method is developed to calculate the azimuthal positions of the double X-ray reflection points as they appear on a double reflection X-ray camera exposure. The germanium CuKα (2, 2, 2) double reflection points are identified according to their measured positions on a film.

Naval Research Lab., Washington, D. C.
OPTIMUM f NUMBER FOR PARABOLIC MIRRORS USED IN NON-IMAGE-FORMING OPTICAL SYSTEMS, by C. T. McComb. 10 Sep 59, 7p. NRL rept. 5396.
Order from LC mi$1.80, ph$1.80 PB 142 490

A study made concerning non-image-forming optical systems has established a set of relationships between detector diameter, f number, and angular field of view. In a non-image-forming system, where target detail and hence aberrations are not important, considerable gain can be realized by use of an f number which minimizes the size of the detector without loss of radiation. Analysis of an optical radiation-collecting system using a parabolic mirror and a plane-surface detector symmetrically located at the mirror focal point shows that the mirror f number, optimized for minimum required detector size, is approximately 0.7 for full angular fields of view up to 30 degrees.

Solid State Physics

Armour Research Foundation, Chicago, Ill.
PROPERTIES OF SULFIDE SEMICONDUCTORS, by John W. Buttrey. Technical rept. no. 2, 1 Jan-31 Dec 58, on Contract AF 49(638)112. Feb 59, 20p. 2 refs. AFOSR-TR-59-4; AD-208 757.
Order from LC mi$2.40, ph$3.30 PB 138 736

Several compounds have been studied (NiS, WS_2, PbTe, MoS_2, Ag_2Te, among others) but those which have received the most effort are As_2Te_3 and Sb_2Se_3.

Battelle Memorial Inst., Columbus, Ohio.
MEASUREMENTS OF BULK LIFETIME IN SILICON, by R. W. Beck, C. S. Peet and A. C. Beer. Scientific rept. no. 3 on Investigations and Measurements of Properties of Single-Crystal Silicon, Contract AF 19(604)1852. 15 Dec 58. 31p. 10 refs. AFCRC-TN-59-110; AD-208 773.
Order from LC mi$3.00, ph$6.30 PB 138 724

Problems involved in the use of the photomagnetoelectric effect to measure lifetime in p-type silicon are discussed. Results for a number of specimens with τ ranging from 20 to 400 msec show good agreement with photoconductivity-decay measurements. Evidence suggests that the behavior of the specimens studied might be explained by means of a single recombination level, if account is taken of nonuniform injection of carriers throughout the depth of the sample. (See also PB 131 585)

Brown U., Providence, R. I.
INVESTIGATIONS OF SURFACE PROPERTIES OF SILICON AND OTHER SEMICONDUCTORS, by H. E. Farnsworth, J. A. Dillon, Jr. and R. E. Schlier. Scientific rept. no. 6, 1 Dec 57-28 Feb 58, on Contract AF 19(604)1952. Mar 58, 9p. 1 ref. AFCRC TN-58-135; AD-146 897.
Order from LC mi$1.80, ph$1.80 PB 138 890

Work on low-energy electron diffraction has been continued on the (111) face of a silicon crystal. In addition to the quenching and annealing effects described in the previous Scientific Report No. 5, the following observations have been made. After a total ion bombardment of 4 hours the pattern for the annealed surface was unchanged from that observed after 2 hours of ion bombardment but that for surface quenched from 1000°C indicated a new surface structure having a triangular network, with a spacing of approximately $\sqrt{19}$ times that of silicon, rotated 23 1/2° with respect to the silicon lattice. An annealing of only 10 min was sufficient to produce a diffraction pattern characteristic of the annealed surface. (See also PB 133 295)

Brown U., Providence, R. I.
INVESTIGATIONS OF SURFACE PROPERTIES OF SILICON AND OTHER SEMICONDUCTORS, by H. E. Farnsworth, J. A. Dillon, Jr., and R. E. Schlier. Scientific rept. no. 8, 1 June-31 Aug 58, on Contract AF 19(604)1952. Sep 58, 29p. 12 refs. AFCRC-TN-58-382; AD-160 835.
Order from LC mi$2.70, ph$4.80 PB 138 858

Low energy electron diffraction methods were employed for study of the surface lattice structures of silicon and silicon carbide, as well as the kinetics of gas adsorption on germanium and silicon. Work function and photoelectric studies of silicon carbide surfaces. (See also PB 138 890)

Brown U., Providence, R. I.
INVESTIGATIONS OF SURFACE PROPERTIES OF SILICON AND OTHER SEMICONDUCTORS, by H. E. Farnsworth, D. Haneman and others. Scientific rept. no. 9, 1 Sep-30 Nov 58, on Contract AF 19(604)1952. Dec 58, 15p. 7 refs. AFCRC-TN-58-591; AD-207 799.
Order from LC mi$2.40, ph$3.30 PB 138 812

Low-Energy electron-diffraction studies of InSb surfaces to determine possible differences in atomic arrangement and adsorption characteristics for oxygen. Measurements on recombination velocities at semiconductor surfaces, are concerned with a separation of the effects of water vapor from those of other constituents.

Brown U., Providence, R. I.
INVESTIGATIONS OF SURFACE PROPERTIES OF SILICON AND OTHER SEMICONDUCTORS, by H. E. Farnsworth, D. Haneman and J. B. Marsh. Scientific rept. no. 11, 31 Mar-31 May 59, on Contract AF 19(604)1952. June 59, 14p. 1 ref. AFCRC-TN-59-372; AD-217 818.
Order from LC mi$2.40, ph$3.30 PB 142 810

Reproducible sharp diffraction patterns have been obtained from a (111) InSb surface, after ion bombardment and annealing treatments. The behavior of pits on this surface caused by the initial etch treatment, and by the subsequent ion bombardment, was studied. Measurements of the mean lifetime of excess current carriers in p-type germanium have been continued. (See also PB 140 638)

Brown U., Providence, R. I.
RESEARCH DIRECTED TOWARD THE INVESTIGATION OF SILICON AND SILICON-CARBIDE SURFACES, by J. A. Dillon, Jr. Scientific rept. no. 1, 1 Oct-31 Dec 58, on Contract AF 19(604)4568. Jan 59, 15p. 17 refs. AFCRC-TN-59-112; AD-208 866.
Order from LC mi$2.40, ph$3.30 PB 138 725

A review of some of the previous work on the thermal etching of metal and semiconductor single crystals is given, and new data concerning the role of the ambient pressure in thermal etching are presented. The results for silicon indicate that temperatures exceeding 1000°C where evaporation of the silicon becomes important, thermal etching occurs even under high-vacuum ($p < 10^{-9}$ mm Hg) conditions. Silicon can be heated at lower temperatures for many hours in high vacuum without evidence of thermal etching.

Conservatoire des Arts-et-Métiers, Paris (France).
INTERNAL DOUBLE REFLECTION IN A PERFECT CRYSTAL, by A. Guinier and E. Guyon. Scientific note no. 1 on Contract AF 61(052)51. 15 Nov 58, 18p. 12 refs. AFOSR TN-59-124; AD-210 429.
Order from LC mi$2.40, ph$3.30 PB 138 784

Double Bragg reflections can occur in perfect single crystals. Streaks are visible starting from the trace of the direct beam towards the primary Bragg spots. Examples of this kind of internal double Bragg reflections are given for LiF, diamond and an alloy Al-Cu.

Departamento de Cristalografía, Madrid (Spain).
STUDIES OF THERMAL MOTION IN CRYSTALS, by J. L. Amorós. Final technical rept. for 15 Dec 56-15 Dec 58 on Contract AF 61(514)1146. [1958] 82p. 49 refs. AFOSR TR-59-47; AD-215 061.
Order from LC mi$4.80, ph$13.80 PB 142 937

Study of thermal motion in crystals by X-Ray thermal diffuse scattering, with the purpose of furthering knowledge of the crystal structural - principles responsible for the atomic vibrations in crystals, development of understanding of thermal wave propagation through the crystal and theoretical interpretation of thermal continuous diffuse scattering and its relation to thermal phenomena.

Detroit U., Mich.
THE STUDY OF PROPERTIES OF SINGLE CdS AND ZnS CRYSTALS FOR USE AS DETECTORS IN CRYSTALS FOR USE AS DETECTORS IN CRYSTAL COUNTERS, by S. J. Czyzak, H. Payne and others. Technical rept. no. 4, 1 Sep 57-31 Aug 58, on Contract Nonr-1511(01). 1 Oct 58, 58p. 22 refs.
Order from LC mi$3.60, ph$9.30 PB 143 223

Contents:
Description of the procedure for growing CdS and ZnS single crystals
Growth mechanism of ZnS single crystals
Theoretical progress
  Solution of the Fermi-Thomas Equation for positive ions
Experimental progress
  Index of refraction
  Dielectric constant
  Absorption and electron charge distribution measurements
  Radiation damage
(See also PB 136 471)

Dynamic Properties Lab., Calif. Inst. of Tech., Pasadena.
TILT BOUNDARY MOTION PRODUCED BY STATIC AND DYNAMIC SHEAR STRESS IN ZINC CRYSTALS, by T. Vreeland, Jr. Rept. on Contract AF 18(600)490. Nov 58, 50p. 12 refs. AFOSR TN-58-1065; AD-207 225.
Order from LC mi$3.30, ph$7.80 PB 138 807

Boundaries in crystals of zone refined zinc move at static stresses of approximately 3 lb/in.^{2}, while stresses of approximately 20 lb/in.^{2} do not move boundaries in 99.999+ per cent purity zinc. The boundary velocity increases with increasing dynamic stress. These observations are discussed in terms of the forces which act on dislocations constituting the small angle tilt boundary.

Eagle-Picher Research Labs., Miami, Okla.
RESEARCH IN PHYSICAL CHEMISTRY AND METALLURGY OF SEMI-CONDUCTING MATERIALS, by K. E. Bean and W. E. Medcalf. Quarterly rept. no. 2, 15 Dec 57-15 Mar 58, on Contract DA 36-039-sc-74890. [1958] 32p. 16 refs.
Order from LC mi$3.00, ph$6.30 PB 138 834

Vapor phase deposition of an initial frangible amorphous layer of silicon on a tantalum filament by the disproportionation of $SiHCl_3$. Elemental boron of high purity was prepared by hydrogen reduction of BCl_3 and BBr_3. X-ray studies of the elemental boron from several runs provided evidence of at least three crystalline structures.

Eagle-Picher Research Labs., Miami, Okla.
RESEARCH IN PHYSICAL CHEMISTRY AND METALLURGY OF SEMI-CONDUCTING MATERIALS, by K. E. Bean, R. J. Starks and W. E. Medcalf. Quarterly rept. no. 3, 15 Mar-15 June 58, on Contract DA 36-039-sc-74890. [1958] 29p. 4 refs. AD-201 950.
Order from LC mi$2.70, ph$4.80 PB 138 835

Studies of the preparation and purification of high purity boron tribromide. The deposition of elemental boron of high purity. The zone refining and growth of crystals of boron by the Czochralski Technique. Study of the chemical, electrical and optical properties of the elemental boron produced. (See also PB 138 834)

Illinois U., Urbana.
EXCITON STATES IN IONIC CRYSTALS, by R. S. Knox and N. Inchauspe. Rept. on Contract AF 18(600)662. June 59, 23p. 25 refs. AFOSR TN-59-556; AD-216 751.
Order from LC mi$2.70, ph$4.80 PB 143 004

Exciton states in ionic crystals are analyzed according to configurations allowed by cubic point symmetry.

Illinois U., Urbana.
HALL MOBILITY OF HOLES IN AgBr, by Roland C. Hanson and Frederick C. Brown. Technical note no. 2 on Contract AF 49(638)579. July 59, 10p. 12 refs. AFOSR-TN-59-752.
Order from LC mi$1.80, ph$1.80 PB 143 030

Illinois U., Urbana.
PHOTOCONDUCTIVE HALL EFFECT IN KCl, by Frederick C. Brown and Nicolas Inchauspe. Rept. on Contract AF 49(638)579. May 59, 3p. 5 refs. AFOSR TN-59-553; AD-216 718.
Order from LC mi$1.80, ph$1.80 PB 143 005

Illinois U., Urbana.
THEORY OF DISLOCATION CLIMB [I] by Robb Thomson. Rept. on Contract AF [49(638)] 420. Feb 59, 48p. 14 refs. AFOSR TN-59-58; AD-209 429
Order from LC mi$3.30, ph$7.80 PB 138 701

A model is constructed which describes the climb of edge dislocations in terms of the nucleation of new jogs from vacancy aggregates on the dislocations. The estimated volume change in copper due to core relaxation is of the order of 1/2 atomic volume per atom length of the dislocation line.

Illinois U., Urbana.
THEORY OF DISLOCATION CLIMB [II] by Robb Thomson. Rept. on Contract AF [49(638)]420. Feb 59, 18p. AFOSR TN-59-59; AD-209 430.
Order from LC mi$2.40, ph$3.30 PB 138 706

A simplified model is constructed for a climbing edge dislocation in a crystal in equilibrium with a flux of vacancies from the lattice. In the anneal condition, the rate of climb is very sensitive to the energy of a nucleated jog, and only slow climb is predicted for dislocations like those of copper and gold where the job energy is high. (See also PB 138 701)

Institute for the Study of Metals, U. of Chicago, Ill.
THE EFFECT OF PRESSURE ON SELF-DIFFUSION IN LEAD, by Norman H. Nachtrieb, Henry A. Resing, and Stuart A. Rice. Rept. on Contract AF 18(600)1489. Feb 59, 14p. 11 refs. AFOSR TN-59-24; AD-208 754.
Order from LC mi$2.40, ph$3.30 PB 138 703

Self-diffusion of lead as a function of temperature from 174° to 322° and for pressures from 1 to 8000 atmospheres.

Institute for the Study of Rate Processes, U. of Utah, Salt Lake City.
A HELICAL DISLOCATION GENERATOR, by Peter Gibbs. Technical rept. no. 4 on Contract Nonr-1288(03). 1 Aug 57, 7p. 2 refs. AD-140 405.
Order from LC mi$1.80, ph$1.80 PB 138 891

A theory is developed which states that because of climb, an edge-type Frank-Read dislocation generator would bulge into that plane normal to the Burgers vector which contains the nodes. By absorbing sufficient vacancies, it could generate dislocation rings in this plane. The process is shown schematically with the dislocation represented as an extra half-plane of atoms between the pinning points.

Institute of Tech., U. of Minnesota, Minneapolis.
STUDY OF NOISE IN SEMI-CONDUCTORS AND SEMI-CONDUCTOR DEVICES, by A. van der Ziel. Quarterly rept. no. 10, 15 Jan-15 Apr 58, and Final rept. for 15 Oct 55-30 May 58 on Contract DA 36-039-sc-70151. [1958] 211p. 72 refs.
Order from LC mi$9.60, ph$33.30 PB 139 069

Equipment for the measurement of noise at liquid helium temperatures has been developed. The noise amplifiers are duplicates from equipment that is already in use. The helium cryostat has been built and is being tested. Equipment for the measurement of transistor noise between 1 and 800 kc has been improved. A low-noise transistor amplifier has been built and tested and was found to perform very satisfactorily. The final report section first deals with the equipment built under the contract during the period. The theory and the experiments on shot noise in junction diodes have been reviewed and compared. Measurements have been made on the noise and the resistance of silicon junction diodes biased in the breakdown region; in addition the open-circuit voltage pulses and the short-circuit current pulses have been studied on a cathode ray oscillograph. Measurements on the correlation of flicker noise sources (emitter emf and collector current generator) indicate practically complete correlation. A short survey of the noise in bulk material is given and the basic ideas of the statistical and the thermodynamical treatments are discussed. Explicit formulas are given for intrinsic and near-intrinsic material and for extrinsic material.

Istituto Elettrotecnico Nazionale "Galileo Ferraris" (Italy).
EXPERIMENTS ON THE SURFACE ELECTRICAL CONDUCTION IN METALS, by Guido Bonfiglioli and Renato Malvano. Technical note no. 2a on Contract AF 61(514)1333. [1956] 26p. 8 refs. AFOSR TN-59-86; AD-210 146.
Order from LC mi$2.70, ph$4.80 PB 138 831

New results are concerned with an A. C. circuit, devised to perform conductivity modulation measurements with higher accuracy than the D. C. bridge used so far. Experimental results are given, concerning Au, Sb, Bi, Cu films, carried on at different temperatures between about -20 and +80°C.

Istituto Elettrotecnico Nazionale "Galileo Ferraris" (Italy).
MAGNETIC RELAXATION AT HIGH TEMPERATURE DUE TO GRAIN BOUNDARY SLIP AND TO DISLOCATIONS, by Guiseppe Biorci, Andrea Ferro and

Giorgio Montalenti. Technical note no. 1a on Contract AF 61(514)1331. Mar 58, 52p. 26 refs. AFOSR TR-58-68; AD-158 275.
Order from LC mi$3.60, ph$9.30 PB 138 878

Internal mechanical friction and magnetic relaxation as a function of temperature on specimens of iron of different origin. Experiments on polycrystals and on very large crystals from 100° to 600° C.

Laboratory for Insulation Research, Mass. Inst. of Tech., Cambridge.
SPACE-CHARGE BUILD-UP IN POTASSIUM BROMIDE CRYSTALS BY A-C METHODS, by D. K. Donald. Rept. on Contract Nonr-1841(10). Feb 58, 23p. 11 refs. Technical rept. no. 125.
Order from LC mi$2.70, ph$4.80 PB 139 180

Previous experiments in this laboratory, using transient techniques, have shown that a space-charge layer forms adjacent to the cathode of a colored KBr crystal when it is illuminated and subjected to a d-c field. It was further demonstrated that even at moderate voltages the space-charge field was sufficient to induce field emission from the cathode. The work reported here applies the space-charge theory of von Hippel et al. to determine the steady-state response to an a-c voltage and to d. c. with superposed a. c. and uses the macroscopic implications as a basis for experiments.

March, N. H.
ELECTRONIC WAVE FUNCTIONS IN PERTURBED METAL LATTICES, by N. H. March and A. M. Murray. Final technical rept. no. 1, 1 May 58-30 Apr 59, on Contract DA 91-508-EUC-305 [1959] 39p. 16 refs.
Order from LC mi$3.00, ph$6.30 PB 143 112

Studies of some simple models for describing the electron distribution round a single vacancy and a single interstitial in metals. The increase in density around a single positive charge in an electron gas of density equal to that in copper metal has been obtained, and the results have been applied to the calculation of the lifetime of a positron in copper. The theoretical lifetime is found to be $(1.8 \pm 0.2) \times 10^{-10}$ sec.

Monitor Products Co., South Pasadena, Calif.
[AT-CUT, PLATED, WIRE MOUNTED CRYSTAL IN THE FREQUENCY RANGE BETWEEN 500 KC AND 1000 KC SUFFICIENTLY SMALL TO BE CONTAINED IN THE HC-6 HOLDER]. Final rept. on Contract W36-039-sc-35574. 10 Feb 49, 12p.
Order from LC mi$2.40, ph$3.30 PB 143 084

Both circular flat and contoured crystals were investigated, as well as rectangular flat and beveled crystals.

Naval Ordnance Lab., White Oak, Md.
GALVANOMAGNETIC PROPERTIES OF LEAD SULFIDE, LEAD SELENIDE AND LEAD TELLURIDE BETWEEN 4.2°K AND ROOM TEMPERATURE, by Robert Stephen Allgaier. 19 June 58, 210p. 113 refs. NAVORD rept. 6037.
Order from LC mi$9.30, ph$31.80 PB 143 318

This report describes the results of an investigation of some basic properties of the semiconductors lead sulfide, lead selenide, and lead telluride.

Physical Metallurgy Lab., Calif. Inst. of Tech., Pasadena.
THEORY OF THE ANHARMONIC PROPERTIES OF SOLIDS, by Edward A. Stern. Technical rept. no. 1 on Contract AF 18(600)1561. June 58 48p. 31 refs. AFOSR TN-58-563; AD-158 381.
Order from LC mi$3.30, ph$7.80 PB 138 863

A theory is presented, which can calculate the anharmonic properties of solids such as thermal expansion, temperature dependence of elastic constants, dependence of elastic constants under stresses, and the deviation of the specific heat from the Dulong-Petit law at high temperatures. The theory is applied to sodium under the assumption of a special force interaction between nearest neighbors only.

Purdue U., Lafayette, Ind.
GROWTH AND CRYSTAL STRUCTURE OF SINGLE CRYSTALS OF $Pr(NO_3)_3 \cdot 6H_2O$, by J. W. Richardson, Q. W. Choi and others. Rept. on Contract AF 18(603)45. July 59, 5p. AFOSR TN-59-638.
Order from LC mi$1.80, ph$1.80 PB 142 977

Radio Corp. of America, Somerville, N. J.
DEVICES 13, 14, AND 15 PER MILITARY SPECIFICATION MIL-T-19500A, INDUSTRIAL PREPAREDNESS REPORT, by Archer E. Mohr, L. D. Armstrong, and D. Des Jardin. Feasibility rept. for 1 Jan-2 Nov 57 on Contract DA 36-039-sc-72709. 11 Nov 57, 125p.
Order from LC mi$6.30, ph$19.80 PB 138 644

In this Feasibility Report, the device design, processing and assembly methods of both the n-p-n and p-n-p versions of Device 13 and 14 and Device 15 are discussed. Performance measurements of the devices are compared to the Objective Specification. A target specification for each device is included. Results of many experimental studies are given and some theoretical aspects of silicon transistor design are discussed.

Radio Corp. of America, Somerville, N. J.
PERFORMANCE DATA ON RESUBMITTED TA-1717 FEASIBILITY SAMPLES PNP VERSION, DEVICE 13, by Archer Mohr. Supplemental rept. on Contract DA 36-039-sc-72709. 11 Nov 57, 7p.
Order from LC mi$1.80, ph$1.80 PB 138 644 S

Rensselaer Polytechnic Inst., Troy, N. Y.
ON MODEL STUDIES OF METALLIC SURFACE ASPERITIES, by F. F. Ling and R. C. Lucek. Technical note no. 4 on Friction between Unlubricated Metallic Surfaces and Surface Mechanics, Contract AF 49(638)67. Dec 58, 28p. 11 refs. AFOSR-TN-58-1134; AD-208 083.
Order from LC mi$2.70, ph$4.80 PB 138 734

An apparatus for measuring two components of the force generated at the tips of two cones throughout the sliding-contact life-cycle is described. The cones are used to simulate a class of surface asperities. The coefficient of friction for a pair of idealized surfaces with asperities in the form of 90^{o} cones and randomly distributed is calculated from considerable amount of test data.

Sylvania Research Labs., Bayside, N. Y.
INFRARED SCATTERING STUDY, by G. H. Schwuttke. Scientific rept. no. 1 on Contract AF 19(604)3482. 1 May 59, 51p. 23 refs. TR 59-300.1; AFCRC TN-59-194; AD-215 825.
Order from LC mi$3.60, ph$9.30 PB 142 964

This report describes the results of a study of the structural imperfections in silicon single crystals by means of infrared scattering and by decoration techniques. Infrared scattering was found to be relatively insensitive and is useful for dislocation densities larger than $10^7/cm^2$. Strong scattering was found in heat treated silicon crystals. Copper decoration of imperfections in silicon was found to depend strongly on the concentration and distribution of oxygen in the crystals. The various forms of copper precipitates and their crystallographic orientation are discussed and related to differences in the strain field around the imperfections.

Uppsala U. (Sweden).
AN X-RAY INVESTIGATION OF THE NICKEL-BORON SYSTEM. THE CRYSTAL STRUCTURE OF ORTHORHOMBIC AND MONOCLINIC Ni_4B_3, by Stig Rundqvist. Technical note no. 6 on Contract AF 61(052)40. 14 Mar 59, 27p. 16 refs. AFOSR-TN-59-415; AD-214 562.
Order from LC mi$2.70, ph$4.80 PB 143 073

Analysis of the nickel-boron system in the range 25-50 atom percent boron with X-ray powder methods. In addition to the previously known intermediate phases Ni_3B, Ni_2B and NiB, two new phases both with compositions close to Ni_4B_3, have been found.

Washington U., Seattle.
THE DEUTERON MAGNETIC RESONANCE SPECTRUM AND RELAXATION IN KD_2PO_4, by John L. Bjorkstam and Edwin A. Uehling. Rept. on Contract AF 49(638)92. 15 Jan 59, 31p. 19 refs. AFOSR TN-58-996; AD-205 902.
Order from LC mi$3.00, ph$6.30 PB 139 216

The electric field gradient (EFG) tensor at the site of the deuteron in the hydrogen bond of KD_2PO_4 and the relaxation times of the deutron have been studied.

Theoretical Physics

Bonn U. (West Germany).
CURRENT TRANSITION GAS-METAL. I. ELECTRODE DISCHARGE COMPONENTS OF THE ARC, by G. Ecker. Technical rept. FTR 1 on Contract DA 91-508-EUC-375. 30 Mar 59, 146p. 822 refs. AD-217 436.
Order from LC mi$7.30, ph$22.80 PB 143 107

An analysis is made covering both theoretical and experimental observations. Considerable literature is involved.

Institute of Mathematical Sciences, New York U., N. Y.
BOUNDS ON THE ELEMENTS OF THE EQUIVALENT NETWORK FOR SCATTERING IN WAVEGUIDES. II. APPLICATION TO DIELECTRIC OBSTACLES, by Ralph Bartram and Larry Spruch. Rept. on Contract AF 19(604)5238. Apr 59, 26p. 5 refs. Research rept. EM-133; AFCRC TN-59-188; AD-215 114.
Order from LC mi$2.70, ph$4.80 PB 142 466

The theory developed in the companion article for obtaining rigorous bounds on $\cot\eta$, where η is the phase shift, is applied to scattering by dielectric obstacles in rectangular waveguides. For the obstacles considered here, bounds are also obtained on the phase shifts directly and on the elements of the equivalent 'T' network. The exact solution for a dielectric slab of finite length which extends to the conducting boundaries of the waveguide and completely encloses the obstacle is introduced as a convenient trial function.

Naval Research Lab., U. of Wisconsin, Madison.
THE EVALUATION OF MULTI CENTER AND EXCHANGE MOLECULAR INTEGRALS BY USE OF THE ZETA FUNCTION METHOD, by M. P. Barnett. Rept. on Contract N7onr-28511. 14 Feb 58, 51p. 19 refs. WIS-ONR-29.
Order from LC mi$3.60, ph$9.30 PB 139 331

Methods are described for the evaluation of the three center one electron resonance, and the two electron exchange, and the two electron three and four center molecular integrals which occur in quantum chemical calculations. Use is made of the zeta function method. The types of molecular integral considered here supplement those dealt with previously by this method, completing the range commonly encountered. Examples are provided of the reduction of all the distinct cases that can occur with these further types of integral.

Thermodynamics

Aeronautical Research Lab., Wright Air Development Center, Wright-Patterson AFB, Ohio.
THE EFFECT OF HIGH CONSTANT PRESSURE SOUND FIELDS ON FREE CONVECTION HEAT TRANSFER FROM A HORIZONTAL CYLINDER, by Jack P. Holman and Tipton P. Mott-Smith. Dec 58, 64p. 11 refs. WADC Technical note 58-352; AD-206 906.
Order from OTS $1.75 PB 151 712

Experimental evidence is given that the heat transfer

coefficient for free convection heat transfer from a horizontal cylinder may be increased by more than 100% in the presence of strong constant pressure sound fields. It was found that the heat transfer coefficient did not appreciably increase until the sound pressure level exceeded a value of approximatley 134 db. The heat transfer coefficient was found to be slightly dependent on frequency in the neighborhood of the critical sound level. The frequency dependence became negligible at higher sound levels of approximately 150 db. In a qualitative analysis attempts are made to explain the test results as an effect of the interaction of the phenomenon of acoustical streaming with the free convection boundary layer. The analysis is complicated by the fact that acoustic disturbances may induce flow separation and turbulence effects on the upper side of the heat transfer cylinder.

Allied Research Associates, Inc., Boston, Mass.
THE MELTING OF FINITE SLABS, by Theodore R. Goodman and John J. Shea. Rept. on Contract AF 49(638)347. 15 Aug 58, 37p. 2 refs. AFOSR-TN-58-824; AD-202 908.
Order from LC mi$3.00, ph$6.30 PB 138 064

An approximate method, known as the heat balance integral, is used to determine the melting rate of a finite slab which is initially at a uniform temperature below the melting point. The slab is acted upon by a constant heat input at one face and has its other face either insulated or kept at its initial temperature. The first three terms of series solutions in an intrinsically small parameter are obtained for the time histories of melting and the temperature distribution in the slab.

Antenna Lab., Calif. Inst. of Tech., Pasadena.
SPATIAL DISTRIBUTION OF THERMAL RADIATION AT MICROWAVE FREQUENCIES, by Nick George. Technical rept. no. 18 on Contract AF 18(600)1113. June 59, 141p. 31 refs. AFOSR-TN-59-598; AD-217 179.
Order from LC mi$7.20, ph$22.80 PB 143 105

Theoretical and experimental radiation patterns are given in spectral form for the thermal radiation from thin slots or heated wires having dimensions of the order of the comparison wavelength. Maxwell's equations and noise theory form the basis of the analyses in which three independent methods are used to predict a spatial distribution which exhibits interference minima and maxima. In the first, the wave equation is solved for a noise-excited transmission line which is suddenly short- and open-circuited at alternate ends. By a study of the trapped noise currents, it is found that the radiation pattern has an interference structure which is smoothed as the loss is increased. Secondly, a formula is derived for the radiation pattern of a heated wire by a computation of its absorption in an isothermal enclosure and by an application of the principle of detailed balancing. Finally, the pattern of a long thin slot is computed directly using the Leontovich-Rytov distributed source generalization of Nyquist's noise formula.

Ballistic Research Labs., Aberdeen Proving Ground, Md.
A DIRECT METHOD TO MEASURE THE THERMAL DIFFUSIVITY OF GASES, by Herbert J. Bomelburg. Nov 58, 22p. 5 refs. Rept. no. 1058.
Order from LC mi$2.70, ph$4.80 PB 138 720

A new method to measure the thermal diffusivity of a gas is presented. It is based on measuring the phase angle of periodic heat waves generated by an a.c. heated hot wire. The method gives satisfactory results at room temperatures but runs into serious experimental difficulties at higher temperatures. Possibilities to overcome those difficulties are proposed.

Delaware U., Newark.
HEAT TRANSFER BY FREE CONVECTION WITH NATURAL COUNTER-FLOW BETWEEN LIQUID AND THE INSIDE WALLS OF VERTICAL PASSAGES, by S. A. Guerrieri, C. V. Foster, and L. L. Saphier. Technical rept. DEL-7-R on Project Squid, Contract Nonr-1858(25). Oct 57, 99p. 18 refs. AD-145 988.
Order from LC mi$5.40, ph$15.30. PB 138 679

The results are presented of an investigation of heat transfer by free convection with natural counterflow between liquids and the inside walls of vertical tubes. Water, Gulf 896 oil, and normal butane were studied inside 12-in. vertical tubes with diameters of 1/2, 3/4, 1, and 3 inches. The tubes were closed at the bottom and open at the top, and connected at the top to a drum, where heat absorbed by the fluid in the heat transfer test tube was removed either by means of a cooling coil in the drum, or by circulating cool test fluid through the drum. The test tube was surrounded by a jacket which, with the tube, formed an annular passage for the recirculated heating fluid stream. Travelling thermocouples were provided inside the tubes to obtain axial and radial temperature profiles, and wall temperatures at points opposite the thermocouple inside the tube. Flow rates and inlet and outlet temperatures of the heating and cooling fluid streams were taken. The heat transfer results are presented as plots of the Nusselt number, N_{Nu}, versus the product of the Gashof number, N_{Gr}, and the Prandtl number, N_{Pr}. The N_{Nu} was varied over a range of approximately 150 to 15,000, while the product of the N_{Gr} and N_{Pr} was varied over a range of 10^{10} to 3×10^{14}. In the latter, below 5×10^{11}, the data may be fairly well represented by published correlations for vertical flat plates in air; in the higher ranges, the data lie near a line parallel to, but almost 90% above, the Eckert-Jackson semi-empirical equation (NACA T. N. 2207 (1950)).

Guggenheim Jet Propulsion Center, Calif. Inst. of Tech., Pasadena, Calif.
THE DETERMINATION OF ABSOLUTE INTENSITIES AND f-NUMBERS FROM SHOCK-TUBE STUDIES, by S. S. Penner. Technical rept. no. 5 on Contract AF 18(603)02. Dec 57, 42p. 71 refs. AFOSR TN-58-11; [AD-142 722].
Order from LC mi$3.30, ph$7.80 PB 139 268

Institute for Fluid Dynamics and Applied Mathematics, U. of Maryland, College Park.
SELECTED TOPICS FROM THE THEORY OF GAS FLOW AT HIGH TEMPERATURES (VI). SOME ASPECTS OF PARTICLE INTERACTION IN GASES, by J. M. Burgers. Rept. on Contract AF 49(638)401. June 59, 42p. 20 refs. Technical note BN-176; AFOSR TN-59-631.
Order from LC mi$3.30, ph$7.80 PB 143 012

Three examples are considered of particle interaction in gases, referring to (a) reactions taking place at close binary encounters; (b) collisions between charged particles treated with the aid of a two-particle distribution function; (c) electric fields which appear when there are differences in positive and negative charge density, as are found in the case of plasma oscillations.

Institute of Molecular Physics, U. of Maryland, College Park.
PROPERTIES OF GASES AT EXTREMELY HIGH TEMPERATURES, by I. Amdur and E. A. Mason. Rept. on Contract Nonr-1841(23). 1 Aug 58, 49p. 37 refs. IMP-OSR-10; AFOSR-TN-58-688; AD-162 222.
Order from LC mi$3.30, ph$7.80 PB 138 881

Known intermolecular force laws are used to calculate virial coefficients of the equation of state and the transport properties at very high temperatures for the rare gases and for molecular nitrogen. The crucial force laws which enable the calculations to be carried to high temperatures are those derived from molecular beam scattering measurements, which are valid at close distances of molecular approach. The calculations cover the temperature range from 1000° to 15,000°K, but take into account only the translational degrees of freedom and neglect the effects of excitation, dissociation, and ionization. The treatment of mixtures is outlined, and illustrated by calculations for the binary system helium-argon. The methods which are used offer an approach to the problem of obtaining reasonably accurate estimates of gas properties at temperatures so high that direct experiments would be extremely difficult, if not impossible.

Massachusetts Inst. of Tech., Cambridge.
ON SOME PROBLEMS IN RADIATIVE HEAT TRANSFER, by Saul S. Abarbanel. Rept. on Contract AF 49(638)207. Apr 59, 217p. 32 refs. Fluid Dynamics Research Group rept. no. 59-1; OSR Technical note no. 59-531; AD-216 538.
Order from LC mi$9.60, ph$33.30 PB 143 008

The time dependent and steady temperature distributions in radiating homogeneous solid conductors are considered in parts I and II respectively. Solutions to the unsteady heat conduction equations were sought for the cases of a semi-infinite solid, a flat plate, a solid sphere and a spherical shell. The initial temperature is taken to the uniform. Radiation into vacuum takes place at the boundaries and follows the Stefan-Boltzman law or a generalized form thereof. It is shown that in all cases the spatial temperature distribution can be deduced from the surface temperature through a Duhamel Integral. The surface temperature problem is then formulated as a singular, non-linear Volterra integral equation, the kernel of which depends on the particular geometry of the body in question. Short and long time asymptotic solutions are found for all the above mentioned goemetries. In addition, as exact solution is found for the semi-infinite solid problem. Part II of the present investigation is concerned with the problems of steady state temperature distribution and radiative heat transfer in high speed free molecule flow.

Massachusetts Inst. of Tech., Cambridge.
ON THE STABILITY OF LAMINAR FLAME-FRONTS, by Wiktor Eckhaus. Rept. on Contract AF 49(638)160. May 59, 101p. 6 refs. Fluid Dynamics Research Group rept. no. 59-4; OSR Technical note 59-562; AD-216 757.
Order from LC mi$5.10, ph$16.80 PB 143 011

A study is made of the stability of a plane laminar flame-front. The effects of the distrubances on the internal flame structure are investigated in detail, using small perturbations technique, and including the mechanism of diffusion, heat conduction and unsteady combustion. A formula for the non-steady flame propagation velocity is derived. The theoretical results are shown to agree with the general trend of the experimentally observed behavior.

Massachusetts Inst. of Tech., Cambridge.
RADIANT HEAT EXCHANGE IN A GAS-FILLED ENCLOSURE, by H. C. Hottel and E. S. Cohen. Rept. on Contract N6ori-105, T. O. 3. Aug 57, 64p. 7 refs. Proj. Squid Technical rept. MIT-14-P; AD-138 820.
Order from LC mi$3.90, ph$10.80 PB 138 931

A method is presented for predicting radiant heat interchange in enclosures where allowance is to be made for gas temperature variation. A set of reception factors permit evaluation of any exchange problem in which the geometry is represented in Cartesian coordinates. The bounding walls of an enclosure and the gas space in it are both divided into zones small enough to be considered isothermal, and an energy balance is made on each zone. For a gas zone, the sum of the radiant energy from all zones, plus the net conduction or convection to it from adjacent gas or surface elements, plus the net enthalpy flux, must equal the radiation originating within the gas zone plus any increase in enthalpy of the zone during the time interval if the process is unsteady in time. Similarly for the surface zone, the sum of the radiant energy received from all gas and surface zones, plus the net convection to the surface must equal the sum of the emission from the surface, the net flux out through it, and its increase in enthalpy if the time is unsteady. The resulting set of equations yields the desired distribution of temperature and flux throughout the enclosure. Evaluation is made of the emission from either a gas zone or a surface zone and the radiant interchange between any 2 of these zones. The geometrical portion is solved independently of the temperature distribution by the cube-square geometrical grid system. This new method may be used on a particular model or class of furnaces in comparison with various engineering shortcuts, to determine the range over which one of the latter may be relied upon. The appendices include (1) the evalua-

tion of $\not{\epsilon}$, the fraction of the energy originating within the cube which leaves the boundaries of the cube, and (2) the evaluation of reception factors.

Naval Ordnance Test Station, China Lake, Calif.
TEMPERATURE TABLES. PART 1. ONE-LAYER PLATE, ONE-SPACE VARIABLE, LINEAR, by Charles J. Thorne. 18 July 57, 715p. 3 refs. NOTS-1756; NAVORD rept. 5562, Pt. 1.
Order from LC mi$11.10, ph$108.90 PB 138 692

Temperatures are given for one-layer plates with heat transfer at both faces. Temperature is a function of distance from one face and time.

Naval Research Lab., U. of Wisconsin, Madison.
GENERALIZATION OF THE EUCKEN APPROXIMATION FOR THE HEAT CONDUCTIVITY OF POLYATOMIC OR CHEMICALLY REACTING GAS MIXTURES, by Joseph O. Hirschfelder. Rept. on Contract N7onr-285(11). 23 Sep 57, 23p. 6 refs. WIS-ONR-25; AD-146 165.
Order from LC mi$2.70, ph$4.80 PB 138 935

The Eucken approximation for the coefficient of heat conductivity of a polyatomic gas is derived on the basis of the macroscopic flux equations derived from the kinetic theory of gases, together with the assumption that the chemical composition is everywhere in equilibrium with the local temperature. The assumption of local chemical equilibrium is equivalent to the utilization of the thermodynamics of irreversible processes. This same procedure is then used to obtain simple expressions for the coefficient of thermal conductivity for a physical mixture of polyatomic gases and for systems involving reacting mixtures. The assumption of chemical equilibrium is valid except in systems containing metastable long lived chemical species. The macroscopic flux equations assume implicitly that nonadiabatic collisions occur infrequently. This condition is generally correct with respect to vibrational and electronic degrees of freedom as well as to chemical reactions. However, rotational energy transfers may occur on almost every collision. As a result, the coefficient of heat conductivity of polar molecules at room temperature are somewhat lower than we might expect from my calculations. As the temperature increases, the Eucken approximation gives better agreement. The introduction contains a discussion of the simplified as well as the exact kinetic theory treatments and shows that physical intuition is a poor guide to an understanding of transport properties.

Norman Bridge Lab. [of Physics] Calif. Inst. of Tech., Pasadena.
THEORY OF HEAT AND MASS TRANSFER FROM A SLOWLY MOVING SPHERE TO THE SURROUNDING MEDIUM, by Leo Breiman. Rept. on Contract N6onr-220(04). 20 Sep 52, 17p. 2 refs. Rept. no. 27-2; ATI-204 534.
Order from LC mi$2.40, ph$3.30 PB 143 101

Ohio State U. Research Foundation, Columbus.
DESIGN CHARTS FOR COOLING AIR DUCTS OF ELECTRICAL MACHINE ROTORS, by J. R. Barnum. Rept. on Heat Transfer Processes within Rotating Electrical Equipment for Aircraft, Contract AF 33(038)19842. Apr 55, 58p. 7 refs. WADC Technical note 55-291; AD-95 751.
Order from LC mi$3.60, ph$9.30 PB 129 600

An iterative calculation procedure, supplemented by graphical methods, is presented for use in evaluating the steady-state cooling characteristics of an internally-ducted air-cooled electrical machine rotor. It is shown how simple modification in the design of rotors of current machine types can bring about better cooling. A calculation example and typical results are included.

Princeton U., N. J.
STATES OF PARTIAL AND COMPLETE EQUILIBRIUM BEHIND SHOCK WAVES IN N_2O AND NO, by W. R. Smith. Rept. on Contract N6ori-105, T. O. 2. Oct 58, 35p. 10 refs. Technical rept. II-25.
Order from LC mi$3.00, ph$6.30 PB 142 823

The properties of steady one-dimensional shock waves propagating in N_2O and NO have been calculated for specific states of partial and complete equilibrium behind the shock waves. The general features of the flow solution for detonation waves are induced from the shock solutions calculated for exothermic reactions in N_2O and NO. A Chapman-Jouguet velocity has been calculated for N_2O.

Rensselaer Polytechnic Inst., Troy, N. Y.
A QUASI-ITERATIVE METHOD FOR COMPUTING INTERFACE TEMPERATURE DISTRIBUTIONS, by F. F. Ling. Technical note no. 3 on Friction Between Unlubricated Surfaces and Surface Mechanics, Contract AF 49(638)67. Oct 58, 28p. 7 refs. AFOSR TN-58-1004; AD-206 147.
Order from LC mi$2.70, ph$4.80 PB 139 294

A simple model of sliding contact is proposed for the experimentalist who is interested in the wear distribution, which is dependent on the temperature distribution of the interface. And a relative simple method is developed for calculating the interface temperature distribution for the proposed model. The method is iterative in nature; the quasi-iterative method developed here reduces drastically the number of quasi-iterations to no more than one in most cases. An example is given to illustrate this point. The method may be extended to more complex models. Although the present method is iterative in nature, the actual labor involved is less than that required for numerical solution of the problem given a degree of computational accuracy. Moreover, it is shown that the interface temperature model can be used as an analogue problem for inverting a class of singular integral equations of the first kind.

Research Inst., Temple U., Philadelphia, Pa.
HIGH TEMPERATURE PROJECT, by A. V. Grosse. Progress rept. no. 3, 1 May-1 Dec 50, on Contract N9onr-87301. 26 Dec 50, 94p. 12 refs. AD-135 201.
Order from LC mi$5.40, ph$15.30 PB 137 762

Contents:
Reaction between aluminum and oxygen
Magnesium pressure runs
Centrifugal runs with aluminum
Combustion of zirconium and silicon in oxygen at atmospheric pressure
Combustion of aluminum in fluorine
The boiling of silver in an aluminum reactor
The thermodynamics of the oxidation of aluminum at high temperatures

Rome U. (Italy).
HEAT CONDUCTION IN SOLIDS AT HYPERSONIC SPEED, by Luigi Broglio. Technical note no. 5 on Contract AF 61(514)888. Oct 58, 28p. 7 refs. SIAR-graph no. 45; AFOSR TN-58-1132; AD-207 977.
Order from LC mi$2.70, ph$4.80 PB 142 980

Part I is essentially an extension of a general approach to the heat conduction problems presented in a previous paper to a body whose thermal properties are depending upon temperature. Part II is an application of Part I to the heat conduction problems in hypersonic flight. Part III is a numerical application of Part I and Part II to a hollow steel hemisphere at hypersonic speed.

Wave Propagation

Armour Research Foundation, Chicago, Ill.
SOLID STATE MILLIMETER WAVE GENERATOR STUDY, by S. A. Marshall and J. W. Buttery. Final rept. no. 1, 1 Nov 56-1 Jan 58, on Contract DA 36-039-sc-73032. [1958] 47p. 28 refs. AD-162 393.
Order from LC mi$3.30, ph$7.80 PB 142 805

The paramagnetic resonance absorption of solids has been studied in order to develop a solid state Maser device of generating and/or amplifying millimeter waves. Particular attention has been concentrated on ruby, (0.1 - 0.5% Cr^{+++} in Al_2O_3) because of its relative crystalline perfection, good thermal properties, and magnetic resonance spectra suitable for the Maser application. The spin-lattice relaxation time of ruby has been determined for the $M_S = -\frac{1}{2} \rightarrow \frac{1}{2}$ transition by both absorption diminution and saturation broadening techniques at two temperatures. Relaxation times of 6.85×10^{-6} seconds and 6.75×10^{-6} seconds are observed for the two methods, respectively, at 77°K. Similar measurements yield an average of 9.0×10^{-6} seconds at 66°K. The data are in agreement with an inverse temperature dependance and give a relaxation time - temperature product of 5.2×10^{-4} sec°K.

Army Signal [Research and Development] Lab., Fort Monmouth, N. J.
FIELD ARMY ELECTROMAGNETIC SPECTRUM ALLOCATION ENGINEERING, by John J. Egli. 19 Apr 57, 8 refs. Technical memo. no. M-1883; AD-131 964.
Order from LC mi$2.40, ph$3.30 PB 138 999

Making use of the established fact that the laws of nature concerning wave propagation, atmospheric noise, man made noise, noise figure of a receiver and antenna gain for a fixed size of antenna do not all vary in the same direction or linearly with frequency, a method of attack is devised for technically engineering the electromagnetic frequency spectrum which involves the determination of the minimum, optimum and maximum frequencies for a system with given constraints. The method which draws liberally upon statistical information is reliable only in so far as the interpretation of this data is properly reflected in assessing statistically field army tactics.

Brown U. Div. of Applied Mathematics, Providence, R. I.
ON THE PROPAGATION OF SHOCK WAVES IN A NON-HOMOGENEOUS ELASTIC MEDIUM, by Eli Sternberg and J. G. Chakravorty. Technical rept. no. 1 on Contract Nonr-562(25). Apr 58, 38p. 8 refs. Rept. 562(25)/1.
Order from LC mi$3.00, ph$6.30 PB 139 246

This paper is concerned with the propagation of shockwaves in a non-homogeneous isotropic plate of infinite extent and arbitrary thickness. The plate has a transverse cylindrical hole at which uniform shearing tractions are suddenly applied and thereafter steadily maintained; the body is otherwise free from loading. It is assumed that the shear modulus of the material is proportional to an arbitrary-- not necessarily integral -- power of the radial distance from the axis of the hole, while no restriction is placed upon the (continuous) radial variation of Young's modulus. The solution obtained, which is which is discussed in detail, constitutes a generalization of results reached by Goodier and Jahsman, who considered the present problem for a homogeneous medium.

Brown U. Div. of Engineering, Providence, R. I.
THE DIFFRACTION AND REFRACTION OF PLANE PULSES, by V. M. Papadopoulos. Scientific rept. no. 4 on Contract AF 19(604)4561. May 59, 35p. 7 refs. AFCRC TN-59-354; AD-216 369.
Order from LC mi$3.00, ph$6.30 PB 143 208

A method for solving problems of plane pulse diffraction by a perfectly conducting wedge is described. The method is extended to give results when a conductive half-plane lies on the surface between two distinct isotropic media of different dielectric properties.

Cornell U. School of Electrical Engineering, Ithaca, N. Y.
THE CORNELL RADIO POLARIMETER, by M. H. Cohen. Final rept. item 2, pt. 2, on Contract AF 30(635)2886. 15 Aug 57, 26p. 10 refs. Research rept. EE 342; RADC-TR-57-188; AD-131 373.
Order from LC mi$2.70, ph$4.80 PB 138 766

The Cornell polarimeter operates on 201.5 mc with a bandwidth of about 10 kc. This bandwidth is an order of magnitude smaller than previously used. The instrument is basically similar to the interference polarimeter built by Little and Payne-Scott, although

it does not operate on an interference basis. The two circular components and the phase and correlation are measured. Ratios of the measured quantities are used graphically to find the polarization percentage and axial ratio.

Cornell U. School of Electrical Engineering, Ithaca, N. Y.
DIVERSITY RECEPTION IN SCATTER COMMUNICATION WITH EMPHASIS ON ANGLE DIVERSITY, by Ralph Bolgiano, Jr., Nelson H. Bryant, and William E. Gordon. Final rept. pt. 1 on Scatter Diversity Study, Contract AF 30(602)1717. 30 Jan 58, 38p. 6 refs. Research rept. EE-359; RADC-TR-58-39; AD-148 655.
Order from LC mi$3.00, ph$6.30 PB 143 149

The manner is considered in which reliability improvement of a scatter propagation diversity system depends upon correlation in the fading of the component channels and upon any asymmetry of the system as to mean signal level of the channels. These factors are considered: lack of channel independence, difference in mean signal levels in the channels, and angle diversity. The concept of angle diversity, the angular separation of 2 receiving antenna beams, appears to have an important role in scatter circuits. A recommendation is made to compare angle and space diversity on an operating scatter circuit. The domestic installation and the AN/FRC-47 are suggested for this test.

Cornell U. School of Electrical Engineering, Ithaca, N. Y.
RADIO NOISE AND ATMOSPHERIC REFRACTION AT VHF AND UHF, by J. Rosson, M. Cohen and others. Quarterly progress rept. no. 8 on Contract AF 30(635)2886. 20 July 57, 46p. 1 ref. Research rept. EE 340; RADC-TN-57-310; AD-131 260.
Order from LC mi$3.30, ph$7.80 PB 138 765

The 53-mc interferometers (north-south and east-west) were operated to produce uncalibrated data. The equipment is being calibrated and adjusted to permit the instantaneous index of refraction to be measured to 1 min of arc through the ionosphere and troposphere. A servomechanism for control of the time-delay unit was constructed and operated in the 53-mc interferometer system. Recording of solar polarization data at 201.5 mc on a bandwidth of 15 kc was continued. Progress was continued on the 201.5-mc interferometer. A preliminary analysis is presented of the polarimeter correlator channel. Ideal receivers are assumed.

Cruft Lab., Harvard U., Cambridge, Mass.
QUARTERLY SCIENTIFIC REPORT NO. 19. Rept. for 1 Jan-1 Apr 58 on Contract AF 19(604)786. 1 Apr 58, 4p. AFCRC TN-58-149; AD-152 380.
Order from LC mi$1.80, ph$1.80 PB 138 889

Contents:
Theory of antennas coupled to two-wire line
The problem of electrical scanning of dipole arrays
Back-scattering measurements
Back-scattering measurements with a pulse method
Scattering from slotted cylinders
The scattering of plane waves by obstacles

Electrical Engineering Research Lab., U. of Texas, Austin.
ELECTROMAGNETIC WAVE PROPAGATION CHARACTERISTICS IN A CLOUD OF RADIOACTIVE PARTICLES FROM A NUCLEAR EXPLOSION, by B. M. Fannin. Rept. on Contract DA 23-072-ORD-763. 10 Aug 56, 14p. 3 refs. Rept. no. 7-09; AD-143 993.
Order from LC mi$2.40, ph$3.30 PB 138 759

Theoretical computations have been made of the attenuation and refraction which can be expected as a result of 100 to 10,000 megacycle radio wave propagation through the ionized air molecules produced by the radioactivity associated with nominal atomic bomb clouds. Qualitative estimates are given for the effects which might be produced by heavier nuclear explosions but there is little information on the radioactive output associated with the fusion type bombs. There is also an analysis of electron characteristics in such clouds, ion production and recombination, and the functional relationship of such phenomena to time. Other characteristics of such fireballs, determined from unclassified literature, are briefly reviewed.

Electrical Engineering Research Lab., U. of Texas, Austin.
PROPAGATION STUDIES AT 8.6-MILLIMETER WAVELENGTH ON 3.5-, 7- AND 12-MILE PATHS, by C. W. Tolbert, A. W. Straiton, and C. D. Tipton. Rept. on Contract Nonr-375(01). 26 June 53, 16p. 5 refs. Rept. no. 69; AD-15 299.
Order from LC mi$2.40, ph$3.30 PB 143 210

A reflex klystron (Raytheon QK 291) operating as a CW generator was used as a signal source at the transmitter. The relative power output was monitored by a bolometer and a conventional bridge circuit. Transmissions of the 8.6-mm waves over 3.5-, 7- and 12-mi paths were within 3.5 db of the free-space value for 36 sets of measurements when rain did not occur. Large transmission losses resulted when showers occurred along the path. The losses were small during a fog. The measured signal strength was lower in 34 out of 36 cases (but by not more than 1.7 db) than the value obtained by subtracting the water-vapor and oxygen-absorption losses from the free-space values. The time fluctuation ranged from 0.2 to 5 db; the larger variations were associated with days on which large-intensity fluctuations of the index of refraction would be expected.

Electrical Engineering Research Lab., U. of Texas, Austin.
SOME PROBLEMS IN MODELING WATER WAVES RELATING TO THE BACK-SCATTERING OF MICROWAVE RADIO ENERGY, by Raymond C. Staley. Rept. on Contract Nonr-375(01). 21 Feb 58, 8p. 15 refs. Rept. no. 98.
Order from LC mi$1.80, ph$1.80 PB 139 315

Maryland U., College Park.
RADIOWAVE PROPAGATION IN INTERPLANETARY MAGNETIC FIELDS, by Allen M. Lenchek. Rept. on Contract AF 49(638)530. Jan 59, 26p. 27 refs. Physics Dept. Technical rept. no. 113; AFOSR-TN-59-165; AD-211 144.
Order from LC mi$2.70, ph$4.80 PB 143 123

It is suggested that certain solar and interplanetary magnetic fields and electron densities may be measurable by means of the rotation of the plane of polarization of radiowaves. A convenient source of polarized radio-waves might be the Crab Nebula. The magnitude of the rotation is calculated for several possible models of a general solar field and for a corpuscular beam. Numerical estimates indicate that, particularly in the case of a non-turbulent solar beam, measurable effects may be obtained. The polarization of the Crab Nebula as a function of wave frequency is discussed. The theory of the Faraday effect for the general case of magnetic field arbitrarily oriented with respect to the direction of propagation is developed in an appendix.

Michigan U. Coll. of Engineering, Ann Arbor.
ELECTROMAGNETIC SCATTERING BY HIGH DENSITY METEOR TRIALS, by Henry Brysk. Rept. on Contract AF 19(604)4993. June 59, 28p. 5 refs. Rept. no. 2871-1-T; AFCRC TN-59-393.
Order from LC mi$2.70, ph$4.80 PB 143 197

The discussion first concerns itself with establishing limits on the validity of the low density approximation. These depend not only on the electron line density (as has sometimes been loosely stated) but also on the wavelength of observation and on the altitude of the trail. Next, a model is developed for scattering by a super-critical density distribution of electrons, based on the idea that the process can still be viewed as a superposition of individual Compton effects, but with the wave incident on the electron attenuated because of refraction (in analogy to the skin effect). Results of this model are compared with those obtained by the usual approach of replacing the electron distribution by a metallic scatterer whose surface is the critical density contour. Some calculations with non-Gaussian electron distributions help to clarify the physical interpretation.

Michigan U. [Research Inst.] Ann Arbor.
STUDIES IN RADAR CROSS SECTIONS XXIII. A VARIATIONAL SOLUTION TO THE PROBLEM OF SCALAR SCATTERING BY A PROLATE SPHEROID, by Frederick B. Sleator. Scientific rept. no. 1 on Contract AF 19(604)1949. Mar 57, 72p. 15 refs. 2591-1-T; AFCRC-TN-57-586; AD-133 631.
Order from LC mi$4.50, ph$12.30 PB 139 006

The present paper represents another attempted breakthrough into the 'unmanageable' third dimension. It is true that the spheroidal scatterer affords perhaps the simplest geometry next to the sphere of any three-dimensional body, and the setup possesses cylindrical symmetry; nonetheless the problem is essentially three-dimensional and this result in addition to that of Kouyoumjian may help to dispel some of the pessimism noted above. The solution obtained may be of little value in itself, since the prolate spheroid has already been dealt with quite extensively by the separation technique. However, it does indicate that the integrations involved in some three-dimensional problems may be more or less manageable, and it may also shed a little more light on the value of the variational method in general.

Michigan U. [Research Inst.] Ann Arbor.
STUDIES IN RADAR CROSS SECTIONS XXV. DIFFRACTION BY AN IMPERFECTLY CONDUCTING WEDGE, by T. B. A. Senior. Scientific rept. no. 2 on Contract AF 19(604)1949. Oct 57, 79p. 19 refs. 2591-2-T; AFCRC TN-57-791; AD-133 746.
Order from LC mi$4.50, ph$12.30 PB 139 005

The problem of the diffraction of a plane electromagnetic wave by an imperfectly conducting wedge is solved subject only to the physical approximation implied by the usual impedance-type boundary conditions imposed on the faces of the wedge. The method is based on one which was originally proposed by A. S. Peters for the treatment of a problem in hydrodynamics and leads to a difference equation for a function related to the Laplace transform of the field with respect to the radial distance from the edge. This is solved exactly to give an expression for the total field valid for any angle of wedge. Several particular cases are examined and some ramifications of the theory are discussed. (See also PB 139 006)

Microwave Physics Lab., Sylvania Electric Products, Inc., Mountain View, Calif.
INVESTIGATION OF SUBMILLIMETER WAVE GENERATION, by E. N. Skomal. Scientific rept. no. 2, 1 Sep-30 Nov 58, on Contract AF 19(604)4081. 1 Dec 58, 11p. AFCRC-TN-58-584; AD-207 075.
Order from LC mi$2.40, ph$3.30 PB 138 738

The theoretical maximum conversion efficiency of the multiple signal conversion process is computed. The computed maximum conversion efficiency of -8.6 db relative to the second harmonic input compares favorably with the measured value of -10 db obtained in upper side band mixing studies. The dependence of the multiple signal conversion output upon input power was examined for samples of ferrite R-1. The slopes of the power output curves are much greater than theoretically predicted. A partial explanation of this discrepancy can be found in the dependence of conversion efficiency upon sample dimensions. (See also PB 137 247)

Microwave Physics Lab., Sylvania Electric Products, Inc., Mountain View, Calif.
INVESTIGATION OF SUBMILLIMETER WAVE GENERATION, by G. J. Wheeler. Final rept. on Contract AF 19(604)4081. 30 June 59, 18p. 6 refs. AFCRC-TR-59-171.
Order from LC mi$2.40, ph$3.30 PB 143 189

See also PB 137 247

Motorola, Inc., Phoenix, Ariz.
ELECTROMAGNETIC PROPAGATION STUDY, by Robert J. Solem. Quarterly rept. no. 3 for period ending 30 June 58 on Contract DA 36-039-sc-74841. [1958] 19p.
Order from LC mi$2.40, ph$3.30 PB 139 095

A study is made of the probable errors involved in taking meteorological readings with equipment considered practical in the field. The effect of the meteorological equipment accuracies on the calculated index-

of-refraction is shown to be the limiting factor in the accuracy of electronic surveying equipment. Results are reported on initial field work employing the XE-1 version of the AN/PPN-13 including comparative operation between conditions employing the auxiliary channel technique and without the channels. A discussion is included of the information expected to be derived from over-water tests to be conducted in November of this year. Basic information regarding simplified multi-path propagation conditions is among the information expected to be derived from these tests.

Navy Electronics Lab., San Diego, Calif.
REFRACTIVE PROPERTIES OF AIR MASSES, by V. G. Plank. 6 Feb 52, 29p. 10 refs. Rept. 243.
Order from LC mi$2.70, ph$4.80 PB 143 103

Survey of literature on tropospheric propagation, refractive-index studies, and air-mass analysis, and analysis of available sounding data for Asia, Europe, North Africa, the East Indies, and North America indicates that the characteristic shape of a refractive-index profile can normally be inferred by considering air-mass and surface-weather information only. It will usually be possible to determine: (a) the probability of occurrence of anomalous refractive conditions, (b) the normal monthly refractive-index profiles, and (c) the normal monthly position of the radio horizon.

New York U., N. Y.
A STUDY OF THE GENERATION AND DETECTION OF ELECTROMAGNETIC WAVES IN THE MILLIMETER WAVE REGION, by J. H. Rohrbaugh. Scientific rept. no. 4, 1 June-31 Aug 58, on Millimeter Wave Project, Contract AF 19(604)2673. [1958] 31p. AFCRC TN-58-556; AD-160 865.
Order from LC mi$3.00, ph$6.30 PB 138 714

Experiments have been done on the 3J31 magnetron in which an attempt is made to vary the third harmonic output by varying the uniformity of the internal magnetron field. Small changes in field uniformity are made by milling narrow slots in the iron pole pieces of the tube. A group of data are given which have been collected from several tubes. These data are preliminary, but show that an enhancement of harmonic power by a factor of three or four is easy to obtain. Details of the manner of cutting the iron are described. Progress reports on the fractional millimeter wave spectrometer being built and on the experiments on the intensity distribution produced by an echelette grating are also included. (See also PB 137 404)

Schwinger, Julian
INVESTIGATION OF HIGH FREQUENCY LIMITATIONS IN MILLIMETER WAVE GENERATORS, by Julian Schwinger. Final rept. for July 58-Feb 59 on Contract DA 36-039-sc-73136. 1959, 27p. 5 refs.
Order from LC mi$2.70, ph$4.80 PB 142 633

Expectation values for field strength and energy in the cavity, in the presence of a driving field and a single molecule, are derived; the power emitted by the molecule is considered; and expressions for the field due to a number of molecules are given.

Stanford Research Inst., Menlo Park, Calif.
UPPER ATMOSPHERE CLUTTER RESEARCH. PART II. PRELIMINARY RESULTS OF 400-MC RADAR INVESTIGATIONS OF AURORAL ECHOES AT COLLEGE, ALASKA, by R. L. Leadabrand, Lambert Dolphin, and A. M. Peterson. Final rept., Pt. 2, on Contract AF 30(602)1462. Oct 57, 41p. 13 refs. RADC TR-58-2B; AD-148 535.
Order from LC mi$3.30, ph$7.80 PB 138 843

A high-intensity 398-mc radar at College, Alaska was used to detect auroral echoes. The radar had a peak power of 60 kw, an average power of 20 kw (maximum), a receiver noise figure of 6.5 db, a receiver bandwidth of 0.3 to 15 kc, and an antenna gain of 36 db. Antenna beamwidth was 3^{o} between the half-power points. The radar was capable of detecting a signal as small as 10^{-16}w. The auroral zone maximum was only 100 km to the magnetic north of College, which did not permit a line of sight from the radar to intersect the earth's magnetic field lines at right angles within the E laver Auroral echoes were observed with off perpendicular intersection angles as great as 10^{o}. Echoes were detected within $\pm 50^{o}$ from magnetic north and at 0^{o} to 17^{o} elevation angles. Echoes detected at greater heights also had greater off perpendicular angles. Echoes were obtained during nearly all hours of the day, although they were most frequent during the evening (1900 to 2300) and early morning (0500 to 0800) hours. Reflection patterns lasted from 1 to 14 minutes. Discrete and diffuse echo types were seen. Discrete echoes corresponded to reflection from visual auroral displays seen within $\pm 95^{o}$ of magnetic north. Diffuse echoes were obtained in the daylight when auroral displays could not be seen. Estimates of the wavelength, λ, dependence of auroral echo power were deduced as λ^{10} for the radar site at College, Alaska, and λ^{5} for sites where perpendicular reflection can be obtained.

Syracuse U. Research Inst., N. Y.
LEXINGTON-SYRACUSE TROPOSPHERIC SCATTER PROPAGATION LINK AND RELATED STUDIES, by Mooshi Namordi, Ralph Wyrick, and Stanford Goldman. Final rept. on Contract AF 19(604)1179. Oct 58, 41p. 3 refs. Rept. no. EE312-581OF; AFCRC TR-59-102; AD-208 867.
Order from LC mi$3.30, ph$7.80 PN 138 773

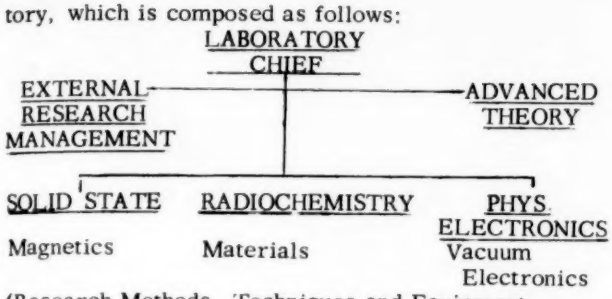
See also PB 136 470

RESEARCH METHODS, TECHNIQUES AND EQUIPMENT

Air Force Cambridge Research Center, Bedford, Mass.
THE ELECTRONIC MATERIAL SCIENCES LABORATORY. Status rept. 1 June 59, 95p. 6 refs. AFCRC TR-59-147; AD-215 822.
Order from LC mi$5.40, ph$15.30 PB 142 960

This status report presents a picture of the research program of the Electronic Material Sciences Labora-

tory, which is composed as follows:



Descriptions of in-house research efforts and summaries of contractual efforts are given. A listing of the contract program is provided in the appendix. Semiannual status reports are planned.

Arnold Engineering Development Center [Tullahoma, Tenn.]
CORRECTION FOR LAG TIME IN PRESSURE MEASURING SYSTEMS, by Max Kinslow. Rept. on ARO, Inc. Contract AF 40(600)700 S/A 13(59-1). Aug 58, 31p. 8 refs. AEDC TR-58-8; AD-161 040.
Order from LC mi$3.00, ph$6.30 PB 138 872

The basic equations for unsteady, compressible, laminar flow in circular tubes are applied to the problem of time lag in pressure measuring systems. By neglecting acceleration forces, the time lag equation is obtained for a constant volume system measuring a varying pressure. The conditions for assuming negligible acceleration and laminar flow are developed and their assumption justified.

Borg Warner Corp. [Chicago, Ill].
"NO BACKLASH" UNIVERSAL JOINT, by R. E. Stokely. Rept. on 16mm Gun Camera Film Titler, Contract AF 33(600)31732. Mar 59, 23p. WADC Technical rept. 59-214; AD-215 536.
Order from OTS $0.75 PB 161 031

The "No Backlash" Universal Joint development program consisted mainly of developing a joint using tapered roller bearings that were preloaded to eliminate backlash. The difficulty encountered was the problem of preloading the tapered roller bearings enough to eliminate the backlash and reducing the tightness or breakaway torque to a minimum. The breakaway torque is a function of the preload and can be controlled by holding the physical properties such as tolerances, surface finishes and alignment, to very close limits. The information and data in this report makes it obvious that special equipment and expert precision work is necessary to produce the "No Backlash" universal joint in production quantities.

Institute for the Study of Metals, U. of Chicago, Ill.
HIGH PRESSURE RESEARCH, SERIES II. Annual rept. no. 2 for Oct 57-Oct 58 on Contract Nonr-2121(03). [1958] 121p. 159 refs.
Order from LC mi$6.30, ph$19.80 PB 143 063

Contents:
Energy transfer in the earth's mantle, by A. W. Lawson and J. C. Jamieson
On the high temperature heat conductivity of some metal oxides, by J. C. Jamieson and A. W. Lawson
Der einfluss hydrostatischen druckes auf die zugverformung von einkristallen, by P. Haasen und A. W. Lawson
The effective ionic charge in alkali halides, by J. E. Hanlon and A. W. Lawson
Thermal conductivity of water at high pressures, by A. W. Lawson, R. Lowell and A. L. Jain
A preliminary report on a new device for obtaining x-ray diffraction patterns from substances exposed to high pressure, by J. C. Jamieson, A. W. Lawson and N. D. Nachtrieb
The pressure dependence of the α - γ transition in iron, by J. C. Jamieson
Self-diffusion in liquids and crystalline solids, by N. H. Nachtrieb
Dilational strain due to lattice defects in copper, by R. W. Keyes
The calculation of volumes of activation for diffusion in solids, by R. W. Keyes
The diffusion of cadmium in silver bromide, by J. Hanlon
The internal friction of cold worked copper, by L. J. Bruner

Litton Industries, Beverly Hills, Calif.
THE INHABITED HIGH VACUUM LABORATORY, by Siegfried Hansen and H. W. Jamieson. Rinal rept. on Contract AF 18(600)1498. 8 Jan 58, 100p. AFOSR-TR-58-14; AD-148 105.
Order from LC mi$5.40, ph$15.30 PB 139 016

This report describes a prototype laboratory which provides the means of human occupancy, observation and manual operations in an environment maintained at an absolute pressure of the order of one billionth of an atmosphere.

Ohio State U. Research Foundation, Columbus.
HAND SIGNALS: FINGER SPELLING, by Henry M. Moser, John J. O'Neill and others. Technical note no. 49 on Contract AF 19(604)1577. Aug 58, 52p. 14 refs. AFCRC TR-58-56; AD-152 648.
Order from LC mi$3.60, ph$9.30 PB 138 809

This study examines the possibilities of using the finger-spelling alphabet of the deaf as a supplementary medium of communication in high level noise and/or other situations where voice communications are not desirable or effective. A history of finger-spelling is included. Results indicated that distance between the sender and the receivers or observers was the prime factor affecting intelligibility. In general the intelligibility of alphabet letters was high enough at such distances as 175 feet to indicate possibilities of using the finger-spelling alphabet as a means of supplementing or clarifying present hand signals now in use.

Rome Air Development Center, Griffiss AFB, N. Y.
HIGH-ALTITUDE SMALL-SCALE AERIAL PHOTOGRAPHY, by Anthony F. DiPentima. July 58, 35p.
RADC-TN-58-165; AD-148 777.
Order from LC mi$3.00, ph$6.30 PB 138 991

RADC sent a balloon-borne camera aloft to an altitude of 100,000 feet in the vicinity of Holloman AFB, New Mexico, on 15 January 1958, in order to obtain high-altitude, small-scale aerial photographs. This report describes the RADC-developed apparatus employed in this mission, and evaluates the photographs obtained.

SOCIAL SCIENCES

Purdue U. School of Industrial Engineering and Management, Lafayette, Ind.
AN ECONOMIC ANALYSIS OF CONTRIBUTIONS UNDER THE INCOME TAX LAWS, by Vernon L. Smith and Floyd E. Gillis. ONR Research Memo. no. 22 on Methodological Aspects of Management Research, Contract Nonr-1100(05). Mar 58, 24p.
7 refs.
Order from LC mi$2.70, ph$4.80 PB 139 261

Classical tools are used to examine the treatment of "gifts in kind" under the Federal Income tax laws as they were but a few years ago, as they are today and as they should be, given the objective that the law appears to be trying to achieve.

Documentation

Armed Services Technical Information Agency, Arlington, Va.
CONFERENCE ON MULTIPLE ASPECT SEARCHING FOR INFORMATION RETRIEVAL, WASHINGTON, D. C., 12-13 FEB 57. [1957] 176p. 21 refs.
AD-147 491.
Order from LC mi$8.10, ph$27.30 PB 143 299

Contents:
Review of ASTIA arrangement with Documentation, Incorporated in development of the uniterm system of coordinate indexing, by James L. Ferguson
Why a documentation system, by Robert S. Bray
Use of concept coordination in the Du Pont engineering department, by Eugene Wall
Report on use of the uniterm system, by Nell Steinmetz
Evaluation of techniques to control research data, by I. A. Warheit.
Modification of a multiple aspect system for company use, by John P. Wadington
Application and retrieval of information, by John A. Sanford
A basic approach to information handling, by Harold Wooster

Posting to cardineer wheels, by Benbow Cheesman
Use of the dashew data poster, by A. F. Caprio
A deep index for internal technical reports, by Fred Whaley
Use of uniterms in large collections, by Isabelle Burtnett
The ONR program on multiple aspect systems, by G. W. Hoover
Matrex junior and use in large collections, by Hans Ullmann
The peek-a-boo-system - optical coincidence subject cards in information searching, by Joshua Stern and W. A. Wildhack

MISCELLANEOUS

Naval Research Lab., Washington, D. C.
REPORT OF NRL PROGRESS, Nov 59.
Order from OTS $1.25, $10.00/year PB 151 344

Contents:
Articles:
Preliminary studies of hazards associated with electrical discharges from the surface of hydrocarbon fuels, by K. G. Williams
A simple closed circuit color television system, by C. Feldman, S. Hersh, and M. A. O'Hara
Display considerations for weapons control radar, by R. H. Brown
Scientific Program:
Applications Research: The trade-off of variables in decision making. Two-dimensional tracking with identical and different control dynamics in each coordinate
Chemistry: Ignition of hydrocarbon vapors by continuous dc arcs. Fluoroalkoxy silanes as potential high-temperature lubricants and hydraulic fluids
Mechanics: Variation of microstrain with test temperatures. Some observations on localized buckling of centrally notched sheet steel specimens. Studies of the yield-delay time for a mild steel. Experimental valveless pulse-jet fog generator. Mechanical impedance as a tool for shock or vibration analysis

Metallurgy and Ceramics: Determination of manganese in titanium alloys. Density of liquid lead and of dilute solutions of nickel in lead. Effect of environment on the creep rate of a nickel-base alloy. Development of high-strength structural steels

Nuclear and Atomic Physics: Study of photons in sodium iodide scintillation crystals

Radio: Frequency detector employing the doppler effect. Inverse networks for electronic circuit applications

Solid State Physics: Color center formation in sodium chloride. Lattice displacements by fast electrons. Lattice vibrations about the U-center. Transient discharges between separating contacts

Supporting Techniques: A low-friction slide rule

ATOMIC ENERGY COMMISSION REPORTS

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Biology and Medicine

Radioisotopes in agriculture: Animal husbandry, fertilizer uptake, plant physiology, photosynthesis, and entomology, by J. A. McCormick. AEC Technical Information Service Extension, Oak Ridge, Tenn. Sep 59. 20p. Order from OTS. 75 cents. TID-3516(Suppl. 1)

Biological blast effects, by Clayton S. White. Lovelace Foundation for Medical Education and Research, Albuquerque, N. Mex. Sep 59. Contract AT(29-1)-1242. 51p. Order from OTS. 50 cents. TID-5564

Ineffectiveness of 1000 roentgens in vitro on the apparent viability of lymphocytes in freshly drawn blood, by Benedict Cassen and Willi Gutfreund. School of Medicine, Univ. of California, Los Angeles, Calif. Aug 59. Contract AT-04-1-GEN-12. 13p. Order from LC. Mi $2.40, ph $3.30. UCLA-445

Constant protein catabolism of Walker Carcinoma 256 and human skin epithelium in tissue culture, by Harry C. Jordan, Leon L. Miller, and Phyllis A. Peters. Atomic Energy Project, Rochester Univ., Rochester, N. Y. Oct 58. Contract W-7405-eng-49. 101p. Order from LC. Mi $5.70, ph $16.80. UR-531

Lead-hydroxy apatite interaction, by Hillel J. Gitelman and William F. Neuman. Atomic Energy Project, Rochester Univ., Rochester, N. Y. June 59. Contract W-7405-eng-49. 25p. Order from LC. Mi $2.70, ph $4.80. UR-551

Deposition, retention and fate of inhaled polonium-210 in rats, by Louis J. Casarett. Atomic Energy Project, Rochester Univ., Rochester, N. Y. June 59. Contract W-7501-eng-49. 61p. Order from LC. Mi $3.90, ph $10.80. UR-552

Chemistry—General

Analysis of yttrium metal and yttrium oxide, copper, nickel, iron and molybdenum (No. 1 of a series), by J. O. Hibbits, W. F. Davis, M. F. Menke. General Electric, Atomic Products Division, Aircraft Nuclear Propulsion Department, Cincinnati, Ohio. Sep 59. Contracts AT(11-1)-171 and AF 33(600)-38062. 22p. Order from OTS. 75 cents. APEX-519

Determination of uranium and molybdenum by selective precipitation with 8-hydroxyquinoline, by L. E. Storms. Goodyear Atomic Corp., Technical Division, Chemistry Department, Portsmouth, Ohio. July 59. Contract AT-(33-2)-1. 11p. Order from OTS. 50 cents. GAT-285

Preparing zircaloy-2 for autoclave testing the pickling and rinsing process, by D. W. Shannon and B. Griggs. Hanford Atomic Products Operation, Materials Development, Richland, Wash. July 59. Contract W-31-109-Eng-52. 82p. Order from OTS. $2.25. HW-60433

Pulse column design, by L. E. Burkhart and R. W. Fahien. Ames Laboratory, Iowa State College, Ames, Iowa. Nov 58. Contract W-7405-Eng-82. 122p. Order from OTS. $2.75. ISC-1095

Recovery of uranium hexafluoride from a process gas stream by absorption-distillation techniques employing a liquid fluorocarbon medium, by R. A. Ebel, C. C. Littlefield, D. C. Brater, and S. H. Smiley. Union Carbide Nuclear Company, Division of Union Carbide Corp., Oak Ridge Gaseous Diffusion Plant, Oak Ridge, Tenn. Oct 59. Contract W7405 eng 26. 36p. Order from OTS. $1.00. K-1366

Some thermodynamic properties of freon-114. Volume I: -40°F. to the critical temperature, by N. H. Van Wie and R. A. Ebel. Union Carbide

Nuclear Company, Division of Union Carbide Corp., Oak Ridge Gaseous Diffusion Plant, Oak Ridge, Tenn. Sep 59. Contract W7405 eng 26. 242p. Order from OTS. $3.50. K-1430

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The nondestructive determination of UO_2 distribution in UO_2-Zr dispersion type fuel plates, by D. G. Miller. Knolls Atomic Power Laboratory, Schenectady, N. Y. Jan 59. Contract W-31-109-Eng-52. 17p. Order from LC. Mi $2.40, ph $3.30. KAPL-M-DGM-2

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Preliminary report on conversion of uranium hexafluoride to uranium dioxide in one-step fluid-bed process, by I. E. Knudsen, N. M. Levitz, and S. Lawroski. Argonne National Laboratory, Chemical Engineering Division, Lemont, Ill. Aug 59. Contract W-31-109-eng-38. 14p. Order from OTS. 50 cents. ANL-6023

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Reprocessing of power reactor fuels, sixth quarterly progress report from January 1 to April 1, 1959, by E. S. Occhipinti, and P. M. Kranzlein. E. I. du Pont de Nemours & Co., Explosives Department, Atomic Energy Division, Technical Division, Savannah River Laboratory, Aiken, S. Car. June 59. Contract AT(07-2)-1. 11p. Order from OTS. 50 cents. DP-393

Electrolytic dissolution of stainless steel, by H. E. Henry. E. I. du Pont de Nemours & Co. Explosives Department, Atomic Energy Division, Technical Division, Savannah River Laboratory, Aiken, S. Car. July 59. Contract AT(07-2)-1. 10p. Order from OTS. 50 cents. DP-396

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An exploding wire as a fuse for the LASL capacitor bank - Zeus, by E. C. Cnare. Sandia Corporation, Albuquerque, N. Mex. June 59. 30p. Order from OTS. $1.00. SC-4324(TR)

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Strontium program, quarterly summary report, by E. P. Hardy, Jr., and S. Klein. United States Atomic Energy Commission, New York Operations Office, N. Y. Oct 59. 207p. Order from OTS. $3.50. HASL-69

S3G radiation protection training guide, by K. E. Fritz and F. W. Richardson. Knolls Atomic Power Lab., Schenectady, N. Y. July 59. Contract W-31-109-Eng-52. 119p. Order from LC. Mi $6.30, ph $19.80. KAPL-A-RP-2

Study of freight train accident experience of Class I railways, by P. F. Meigs. Sandia Corporation Reprint, Albuquerque, N. Mex. Aug 59. 25p. Order from OTS. 75 cents. SCR-111

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Evaluation of countermeasure system components and operational procedures, by W. E. Strope. U. S. Naval Radiological Defense Laboratory, San Francisco, Calif. Aug 58. 165p. Order from OTS. $3.00. WT-1464

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Ionization chambers for reactor operation, by W. Lones. Brookhaven National Laboratory, Associated Univ., Inc., Upton, N. Y. May 59. 8p. Order from OTS. 50 cents. BNL 561 (T-150)

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Some further modifications and techniques applied to the RCA type EMU electron microscope, by F. W. Bishop. The University of California, School of Medicine, Los Angeles, Calif. Sep 59. Contract AT(04-1) 1 GEN-12. 35p. Order from OTS. $1.00. UCLA-447

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Recording quartz differential dilatometer, by L. T. Lloyd. Argonne National Laboratory, Lemont, Ill. July 59. Contract W-31-109-eng-38. 45p. Order from OTS. $1.50. ANL-5372

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The radial distribution of thermal neutron flux in cylindrical fuel specimens during neutron irradiation, by F. R. Taraba and S. H. Paine. A Argonne National Laboratory, Lemont, Ill. Aug 59. Contract W-31-109-eng-38. 37p. Order from OTS. $1.25. ANL-5872

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Casting of a uranium shield for a kilocurie cobalt-60 source, by R. J. Dunworth and R. E. Macherey. Argonne National Laboratory, Metallurgy Division, Lemont, Ill. Aug 59. Contract W-31-109-eng-38. 12p. Order from OTS. 50 cents. ANL-6007

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Process relating to civilian applications during May, 1959, by R. W. Dayton and C. R. Tipton, Jr. Battelle Memorial Institute, Columbus, Ohio. June 59. Decl. July 59. Contract W-7405-eng-92. 95p. Order from OTS. $2.50. BMI-1346

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Development of uranium nitride-stainless steel dispersion fuel elements, by S. J. Paprocki, D. L. Keller, G. W. Cunningham and A. K. Foulds, Jr. Battelle Memorial Institute, Columbus, Ohio. July 59. Contract W-7405-eng-92. 21p. Order from OTS. 75 cents. BMI-1365

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The effects of low neutron exposures at low temperatures on the hardness and tensile properties of natural uranium, by A. L. Bement. Hanford Atomic Products Operation, Richland, Wash. June 59. Contract W-31-109-Eng-52. 64p. Order from OTS. $1.75. HW-60326

End closure for plutonium bearing zircaloy-2-clad fuel elements, by L. C. Lemon. Hanford Atomic Products Operation, Richland, Wash. June 59. Contract W-31-109-Eng-52. 13p. Order from OTS. 50 cents. HW-60910

Utilizing two welding processes in tandem, by E. C. Alexander and J. D. Nicol. Union Carbide Nuclear Co., Division of Union Carbide Corp., Paducah Plant, Paducah, Ky. Sep 59. 11p. Order from OTS. 50 cents. KY-314

Applications of cutting and welding processes, by E. C. Alexander and J. D. Nicol. Union Carbide Nuclear Co., Division of Union Carbide Corp., Paducah Plant, Paducah, Ky. Oct 59. 12p. Order from OTS. 50 cents KY-315

Behavior of structural materials exposed to an organic moderated reactor environment, by N. J. Gioseffi and H. E. Kline. Atomics International , Division of North American Aviation, Inc., Canoga Park, Calif. Oct 59. Contract AT(11-1)-GEN-8. 41p. Order from OTS. $1.25. NAA-SR-2570

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Gas bubble formation in irradiated plastics and reactor fuels, by G. G. Bentle. Atomics International, Division of North American Aviation, Inc., Canoga Park, Calif. Oct 59. Contract AT(11-1)-GEN-8. 30p. Order from OTS. $1.00. NAA-SR-3085

Electrical heating methods for liquid-metal systems, by R. S. Baker and H. W. Lohman. Atomics International, Division of North American Aviation, Inc., Canoga Park, Calif. Sep 59. Contract AT(11-1)-GEN-8. 16p. Order from OTS. 50 cents. NAA-SR-3882

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Vibratory compaction and swaging of uranium dioxide to high density, by B. A. Webb. Atomics International, Division of North American Aviation, Inc., Canoga Park, Calif. Oct 59. Contract AT(11-1)-GEN-8. 18p.. Order from OTS. 50 cents. NAA-SR-4155

Applications of ultrasonic energy. Progress report no. 12, covering period from October 1, 1958 to November 30, 1958. Aeroprojects, Inc., West Chester, Penna. Dec 58. Contract AT-(30-1)-1836. 28p. Order from LC. Mi $2.70, ph $4.80. NYO-7933

Fundamentals of diffusional bonding - IV. Fourth annual progress report for July 1, 1958 through June 30, 1959, by L. S. Castleman and L. Seigle. Research Laboratories, Sylvania Electric Products, Inc., Bayside, New York.

June 59. Contract AT(30-1)-2102. 24p. Order from OTS. 75 cents. SEP-253

Fuel elements conference, held at Gatlinburg, Tennessee, May 14 - 16, 1958, by C. Goodman, J. A. Lane and others. Atomic Energy Commission Division of Research, Atomic Energy Commission Division of Reactor Development, and Oak Ridge National Laboratory, Oak Ridge, Tenn. Aug 59. 308p. Order from OTS. $3.00. TID-7559(Part 1)

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Electrostatic tracking of the proton beam of the bevatron, by Harry G. Heard. University of California, Lawrence Radiation Laboratory, Berkeley, Calif. June 59. Contract W-7405-eng-48. 18p. Order from OTS. 75 cents. UCRL-8808

The beam-controlled frequency-correction system of the bevatron, by H. G. Heard. University of California, Lawrence Radiation Laboratory, Berkeley, Calif. July 59. Contract W-7405-eng-48. 20p. Order from OTS. 75 cents. UCRL-8828

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RE-34, an IBM-704 reactor shielding program, by M. K. Butler and J. M. Cook. Argonne National Laboratory, Applied Mathematics Division, Lemont, Ill. June 59. Contract W-31-109-eng-38. 50p. Order from OTS. $1.75. ANL-5859

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Specific activities of nuclides, $Z > 87$, by N. M. Isaac and J. W. Wilkins. Argonne National Laboratory, Chemistry Division, Lemont, Ill. Sep 59. Contract W-31-109-eng-38. 10p. Order from OTS. 50 cents. ANL-6042

The relation between regression coefficients in a multiple-regression analysis, by J. E. Monahan. Argonne National Laboratory, Lemont, Ill. Sep 59. Contract W-31-109-eng-38. 16p. Order from OTS. 75 cents. ANL-6061

An IBM 704 program for the solution of the neutron transport equation in fifty concentric cylindrical annuli by the Weil method, program I_2, by R. R. McCready and D. B. Vollenweider. General Electric , Atomic Products Division, Aircraft Nuclear Propulsion Department, Cincinnati, Ohio. Sep 59. Contracts AF 33(600)-38062 and AT(11-1)-171. 63p. Order from OTS. $1.75. APEX-468

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Comparison of computed centerline dose rates from different areas of a source plate, by A. W. Casper,and J. G. Carver. General Electric Atomic Products Division, Aircraft Nuclear Propulsion Department, Cincinnati, Ohio. Nov 58. Contracts AF 33(600)-38062 and AT-(11-1)-171. 29p. Order from OTS. $1.00. APEX-507

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Thermal conductivity of silicon carbide powder, by Armour Research Foundation. General Electric Atomic Products Division, Aircraft Nuclear Propulsion Department, Cincinnati, Ohio. Sep 59. Contracts AF 33(600)-38062 and AT (11-1)-171. 6p. Order from OTS. 50 cents. APEX-516

SEDP-synthetic experiment design program, by F. D. Wenstrup. General Electric, Atomic Products Division, Aircraft Nuclear Propulsion Department, Cincinnati, Ohio. Nov 58. Contracts AF 33(600)-38062 and AT (11-1)-171.

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APEX-521

Polarization of neutrons from the reactions Li^7 (p, n)Be^7 and D(d, n)He^5, by J. A. Baicker. Columbia University, Department of Physics, New York, N. Y. Jan 59. Contract AT(30-1)-Gen-72. 73p. Order from OTS. $2.00.
CU-183

Neutrons resonances in U^{238}, by J. L. Rosen. Columbia University, Department of Physics, New York, N. Y. May 59. Contract AT(30-1)-Gen-72. 73p. Order from OTS. $2.00.
CU-185

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GAT-T-673

Nuclear physics research quarterly report, January, February, March, 1959, by the Staff of Nuclear Research Operation. Hanford Atomic Products Operation, Richland, Wash. Apr 59. Contract W-31-109-Eng-52. 84p. Order from OTS. $2.25.
HW-60220

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HW-60275

The nuclear energy levels and metastable states in the decay of Yb^{169}, by G. W. Eakins and E. N. Jensen. Ames Laboratory, Iowa State College, Ames, Iowa. Dec 57. Contract W-7405-Eng-82. 77p. Order from OTS. $2.00.
ISC-1007

Knudsen flow through a channel with rough walls, by W. C. DeMarcus and D. M. Lang. Union Carbide Nuclear Company, Division of Union Carbide Corp., Oak Ridge Gaseous Diffusion Plant, Oak Ridge, Tenn. Oct 59. Contract W-7405-eng-26. 10p. Order from OTS. 50 cents.
K-1435

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LA-2301

X-ray crystallographic extrapolation functions, by D. L. Cooper, T. L. Jordan, Jr., and C. P. Kempter. Los Alamos Scientific Laboratory, University of California, Los Alamos, N. Mex. Mar 59. Contract W-7405-ENG-36. 189p. Order from OTS. $3.00.
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LA-2316

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LA-2317

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LAMS-2325

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ORNL-2350

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ORNL-2729

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Radiosonde observations analysis of system and personal errors, by W. D. Lang. Sandia Corporation, Albuquerque, N. Mex. May 59. 32p. Order from OTS. $1.00. SCTM 177-59-(52)

Electrical operations manual for the Sandia Corporation twelve-inch wind tunnel, by M. G. Baker. Sandia Corporation, Albuquerque, N. Mex. Apr 58. Contract AT-(29-1)-789. 35p. Order from OTS. $1.00. SCTM 188-58-(51)

Ferromagnetic and ferroelectric one-shot explosive-electric transducers, by F. W. Neilson. Sandia Corporation, Albuquerque, N. Mex. Nov 56. 40p. Order from OTS. $1.25. SCTM-230B-56-51

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Adler Electronics, Inc., New Rochelle, N. Y.	205	140 485
Advanced Electronics Center, General Electric Co., Ithaca, N. Y.	454	142 222
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AER, Inc., Pasadena, Calif.	365	140 748
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Aerial Reconnaisance Lab., Wright Air Development Center, Wright-Patterson AFB, Ohio.	43	140 168
Aero Medical Lab., Wright Air Development Center, Wright-Patterson AFB, Ohio.	10	130 361
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Aero-Space Labs., North American Aviation, Inc.	232	140 424
AeroChem Research Labs., Inc., Princeton, N. J.	210	151 796
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Aeroelastic and Structures Research Lab., Mass. Inst. of Tech., Cambridge	101	140 041
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Aerojet-General Corp., Azusa, Calif.	83	140 356
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Aeromedical and Physical Environment Lab., U. of Illinois, Urbana.	14	135 465
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Aeronautical Materials Lab., Naval Air Material Center, Philadelphia, Pa.	36	140 244
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Aeronautical Research Lab., Wright Air Development Center, Wright-Patterson AFB, Ohio.	95	151 709
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Aerophysics Development Corp., Santa Barbara, Calif.	452	151 618
Aeroprojects, Inc., West Chester, Pa.	726	143 546
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		151 758
		151 759
	214	140 332
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		140 338
		151 757
	240	151 756
	325	151 613
		151 695
	451	151 617
	452	142 362
	454	151 614
		151 615
	563	151 982
	583	151 975
		151 984
		151 986
	584	151 980
		151 983
		151 985
	587	151 981
	693	142 888
	697	142 889
	699	142 883
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Burroughs Corp., Philadelphia, Pa.	740	138 883
California Inst. of Tech., Pasadena	35	151 461
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	636	139 067
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		140 154
	102	130 330
	107	139 961
	110	138 486
	162	140 476
	221	140 426
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	222	140 700
	308	139 578
	355	139 337
	387	151 532
	432	139 373
	446	142 044
	457	151 886
		151 887
		151 888
	479	142 365
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	629	151 961
	673	139 256
	684	142 827
	685	142 949
	691	142 918
	697	128 512
	736	138 957
	736	138 973
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California U., Davis.	208	140 742
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	457	142 298
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	621	142 574
	678	138 915
	687	143 195
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	746	138 968
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California U., Santa Barbara	622	142 587
Callery Chemical Co., Pa.	24	129 502
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Calvin Coll., Grand Rapids, Mich.	166	140 282
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Carborundum Co., Niagara Falls, N. Y.	81	140 177
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Carnegie Inst. of Tech., Pittsburgh, Pa.	78	139 399
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	222	140 336
		140 533
	247	140 387
	356	140 959
	380	140 900
	388	140 879
	480	142 153
	630	139 388
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Carnegie Inst. of Tech. Graduate School of Industrial Administration, Pittsburgh, Pa.	76	136 108
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		136 680
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Case Inst. of Tech., Cleveland, Ohio.	47	139 897
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Cedars of Lebanon Hospital, Los Angeles, Calif.	432	137 462
Center for Aerial Photographic Studies, Cornell U., Ithaca, N. Y.	579	142 681
Center for Documentation and Communication Research, Western Reserve U., Cleveland, Ohio.	265	151 639
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Central Inst. for Industrial Research (Norway)	239	151 236
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Centro di Studio per la Fisica delle Microonde (Italy)	114	135 231
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Centronix, Inc., Cocoa, Fla.	66	136 466
Chance Vought Aircraft, Inc., Dallas, Tex.	368	139 655
Chemical Corps, Army Chemical Center, Md.	70	139 958
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Chemical Corps Medical Labs., Army Chemical Center, Md.	18	140 006
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Chemical Corps School, Army Chemical Center, Md.	243	140 302
Chesapeake Bay Inst., Johns Hopkins U., Annapolis, Md.	164	136 726
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Chicago Development Corp., Riverdale, Md.	24	129 901
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Chicago Midway Labs., U. of Chicago, Ill.	458	137 372
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Chicago U., Ill.	31	139 308
	160	136 754
	166	139 200
	171	136 707
	217	140 844
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	438	151 857
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	480	140 997
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Cinch Mfg. Corp., Chicago, Ill.	186	140 380
City college of the city of New York	11	136 702
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Coastal Studies Inst., Louisiana State U., Baton Rouge	29	139 869
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Coast and Geodetic Survey, Washington, D. C.	687	143 271
Coating and Chemical Lab., Aberdeen Proving Ground, Md.	88	137 545
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	240	151 527
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College of Forestry, Syracuse U., N. Y.	606	142 747
Collins Radio Co., Cedar Rapids, Iowa	47	135 701
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	361	140 816
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Conservatorie des Arts-et-Metiers, Paris (France)	766	138 784
Continental Electronics Mfg. Co., Dallas, Tex.	458	142 349
Control Systems Lab., U. of Illinois, Urbana	246	136 019
Convair, Fort Worth, Tex.	242	140 717
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Convair, Pomona, Calif.	515	139 663
Convertawings, Inc., Amityville, N. Y.	581	142 581
Copenhagen U. (Denmark)	431	142 099
Cornell Aeronautical Lab., Inc., Buffalo, N. Y.	36	136 280
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	574	142 491
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		151 959
		151 963
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Corning Glass Works, N. Y.	187	140 664
Council of Library Resources, Inc., Washington, D. C.	521	137 461
Courtney and Co., Philadelphia, Pa.	298	137 355
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Cruft Lab., Harvard U., Cambridge, Mass.	328	137 261
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Cyclotron Lab., U. of Illinois, Urbana	623	142 820
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Dalmo Victor Co., Belmont, Calif.	703	142 999
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Davenport Besler Corp., Iowa	79	135 629
David Sarnoff Research Center Princeton, N. J.	48	135 519
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David Taylor Model Basin, Washington, D. C.	48	139 941
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	179	136 570
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Dayton U., Ohio.	703	131 976
Defense Metals Infromation Center, Battelle Memorial Inst., Columbus, Ohio.	76	151 065
	86	151 064
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Defense Research Lab., U. of Texas, Austin	363	137 046
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Departamento de Cristalografia, Madrid (Spain)	766	142 937
Detroit Arsenal, Center Line, Mich.	497	139 591
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Detroit Control Corp., Mich.	191	140 490
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Diamond Ordnance Fuze Labs., Washington, D. C.	113	137 411
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Dikewood Corp., Albuquerque, N. Mex.	187	140 410
Directorate of Flight and All-Weather Testing, Wright-Patterson AFB, Ohio.	37	131 217
DK Mfg. Co., Inc., Chicago, Ill.	602	151 700
Documentation, Inc., Washington, D. C.	521	137 377
Douglas Aircraft Co., Inc., El Segundo, Calif.	582	142 547
Dow Chemical Co., Midland, Mich.	367	140 950
Dublin Inst. for Advanced Studies (Eire)	667	143 031
Duke U., Durham, N. C.	19	135 865
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Duke U. Medical Center, Durham, N. C.	431	151 892
DuMont, Allen B., Labs., Inc., Clifton, N. J.	678	138 869
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Dunlap and Associates, Inc., Stamford, Conn.	298	151 285
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Dynamic Analysis and Control Lab., Mass. Inst. of Tech., Cambridge	227	140 681
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Dynamic Properties Lab., Calif. Inst. of Tech., Pasadena	754	138 785
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Eagle-Picher Research Labs., Joplin, Mo.	252	140 267
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Eagle-Picher Research Labs., Miami, Okla.	252	136 614
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Earthquake Research Lab., Calif Inst. of Tech., Pasadena	687	143 319
Eastern Air Lines, Atlanta, Ga.	687	142 969
Eastman Kodak Co., Rochester, N. Y.	187	140 618
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Eaton Electronics Research Lab., McGill U. (Canada)	117	139 912
Ecole Normale Superieure, Paris (France)	371	139 557
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Educational Research Corp., Cambridge, Mass.	300	140 906
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Eitel-McCullough, Inc., San Bruno, Calif.	589	151 919
Electric Tachometer Co., Philadelphia, Pa.	72	132 998
Electrical Engineering Research Lab., U. of Illinois, Urbana	25	135 398
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	253	140 400
	329	137 068
		137 069
		140 807
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	388	139 558
	459	142 402
	517	140 993
	589	142 720
	704	142 996
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Electrical Engineering Research U. of Texas, Austin	264	136 746
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	459	142 035
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Electrical Testing Labs., Inc., New York	589	142 715
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Electro-Acoustic Lab., Harvard U., Cambridge, Mass.	711	143 405
Electro Engineering Products, Inc., Chicago, Ill.	704	138 895
Electro-Mechanical Research, Inc., Sarasota, Fla.	704	143 234
Electro-Optical Systems, Inc., Pasadena, Calif.	35	151 461
Electrochemical Research Lab., Western Reserve U., Cleveland, Ohio.	574	142 562
Electromagnetic Research Corp., Washington, D. C.	638	142 774
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Electron Tube Lab., U. of Michigan, Ann Arbor	50	135 511
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Electron Tube Research Lab., U. of Minn. Minneapolis	188	140 679
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Electronic Communications, Inc., Timonium, Md.	329	137 007
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Electronic Components Lab., Wright Air Development Center, Wright-Patterson AFB, Ohio	632	151 993
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Electronics Corp. of America, Cambridge, Mass.	39	151 577
Electronics Research Lab., Stanford U., Calif.	460	142 433
Electronics Research Lab., U. of California, Berkeley	50	135 875
		139 940
	51	135 246
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		136 487
		139 993
	188	140 396
	227	140 677
	329	139 647
	330	140 766
	377	137 153
	460	137 474
		139 448
		142 398
		151 607
	590	142 560
		142 564
		151 829
	591	139 325
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	762	138 741
Electronics Research Labs., Columbia U., New York	114	135 208
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	461	142 405
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Ellis and Watts Products, Inc., Cincinnati, Ohio.	582	142 649
Emerson and Cuming, Inc., Canton, Mass.	461	137 480
Emory U., Ga.	507	137 496
Engineering Div., Air Material Command, Wright-Patterson AFB, Ohio	188	136 065
	582	142 668
Essex Mills, Inc.	375	151 704
Esso Research and Engineering Co., Linden, N. J.	350	140 780
European Office, Air Research and Development Command	94	135 584
Evans Research and Development Corp., New York	510	151 929
Experiment, Inc., Richmond, Va.	25	128 504
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Explosives Research Group, U. of Utah, Salt Lake City.	67	136 441
	469	140 988
F-R Machine Works, Inc., Woodside, N. Y.	591	142 650
Fabric Research Labs., Inc., Boston, Mass.	477	151 861
Fabric Research Labs., Inc., Dedham, Mass.	86	140 181

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Fairchild Engine Div., Deer Park, N. Y.	314	140 848
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	758	151 989
Fansteel Metallurgical Corp., North Chicago, Ill.	352	137 032
Fels Group Dynamics Center, U. of Delaware, Newark	302	137 122
Feltman Research and Engineering Labs., Picatinny Arsenal, Dover, N. J. (formerly Samuel Feltman Ammunition Labs.)	67	135 092
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		140 024
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		139 502
		140 936
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	341	139 590
	343	140 736
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		151 847
	350	140 754
	353	151 730
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	470	139 441
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Ferranti Electric, Inc., New York	93	135 384
Field Emission Lab., Pennsylvania State U., University Park	115	136 386
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Flight Control Lab., Wright Air Development Center, Wright-Patterson AFB, Ohio.	451	142 243
Flight Research Lab., Wright Air Development Center, Wright-Patterson AFB, Ohio	90	140 167
Florida State U., Tallahassee	31	137 176
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Florida U., Gainesville	165	136 733
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Fluidyne Engineering Corp., Minneapolis, Minn.	37	151 710
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Fluor Corp., Ltd., Los Angeles, Calif.	698	161 062
Fluor Corp., Ltd., Whittier, Calif.	698	161 010
Fordham U. School of Education, New York	670	138 836
		138 920
Forest Products Lab., Madison, Wis.	602	151 945
Frankford Arsenal, Philadelphia, Pa.	205	140 553
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	618	142 509
Franklin Inst. Labs. for Research and Development, Philadelphia, Pa.	15	140 052
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	217	140 242
	266	136 092
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Fuels Research Lab., Mass. Inst. of Tech., Cambridge	731	151 723
Gas Turbine Lab., Mass. Inst. of Tech., Cambridge	363	140 917
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General Electric Co.	102	130 330
Cincinnati, Ohio.	636	142 503
Owensboro, Ky.	591	151 830
General Electric Co., Schenectady, N. Y.	51	139 900
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General Electric Co., Syracuse, N. Y.	461	137 405
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General Electric Research Lab., Schenectady, N. Y.	330	137 249
General Electronic Labs., Inc., Cambridge, Mass.	705	143 358
General Mills, Inc., Minneapolis, Minn.	87	140 105
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General Radio Co., Cambridge, Mass.	592	142 534
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General Tire and Rubber Co., Wabash, Ind.	217	136 850
Geophysical Inst., U. of Alaska, College	171	136 170
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Geophysical Lab., Carnegie Inst. of Washington, D. C.	68	140 007
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George Hubert Jones Chemical Lab., U. of Chicago, Ill.	452	140 968
George Washington U., Washington, D. C.	51	139 969
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Georgetown Coll. Observatory, Washington, D. C.	564	139 423
Georgetown U. Medical Center, Washington, D. C.	421	142 087
Georgia Inst. of Tech., Atlanta, Ga.	451	142 082
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Georgia Inst. of Tech., Engineering Experiment Station, Atlanta, Ga.	82	139 926
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	475	142 326
	592	139 432
		139 433
		142 619
		151 944
	632	142 627
		142 628
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	705	138 923
		142 620
Georgia Inst. of Tech. Engineering Experiment Station, Atlanta, Ga. (con.)	705	142 621
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Georgia U., Athens	481	142 337
Gibbs Chemical Lab., Harvard U., Cambridge, Mass.	167	140 782
Glenco Corp., Metuchen, N. J.	706	138 662
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Goodrich, B. F., Co., Brecksville, Ohio.	22	139 748
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Gordon McKay Lab. of Applied Science, Harvard U., Cambridge	254	140 386
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Gottingen U. (West Germany)	389	137 160
Grinnell Coll., Iowa	439	137 485
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Guggenheim Aeronautical Lab., Calif. Inst. of Tech., Pasadena.	38	135 121
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Guggenheim Jet Propulsion Center, Calif. Inst. of Tech., Pasadena	315	139 650
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Guided Radio Corp., New York	57	132 995
Gulf Oil Corp., Philadelphia, Pa.	476	140 961
Hahnemann Medical Coll., Philadelphia, Pa.	679	139 361
Haller, Raymond, and Brown, Inc., State College, Pa.	84	151 237
Haloid Co., Rochester, N. Y.	52	135 502
Harnischfeger Corp., Milwaukee, Wis.	473	142 428
Harvard Black Rock Forest, Cornwall-on-the-Hudson, New York	153	140 305
Harvard Coll. Observatory, Cambridge, Mass.	109	135 251
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Harvard Coll. Observatory, Fort Davis, Tex.	297	136 494
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Harvard U. Div. of Engineering and Applied Physics, Cambridge, Mass.	96	139 827
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Harvey Aluminum Sales, Inc., Torrance, Calif.	727	143 119
Hawaii Inst. of Geophysics, Honolulu.	172	140 704
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Heat Transfer Lab., Mass. Inst. of Tech., Cambridge	97	151 717
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Heat Transfer Lab., U. of Minnesota, Minneapolis	96	151 680
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Hebrew U. (Israel)	223	136 738
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	381	136 995
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High Altitude Observatory, Boulder, Colo.	67	135 210
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Hiller Helicopters, Palo Alto, Calif.	233	136 749
Hofstra Coll., Hempstead, New York	306	137 345
Honeywell Research Center, Hopkins, Minn.	241	140 440
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Hopkins Marine Station, Stanford U., Pacific Grove, Calif.	376	139 476
Horizons, Inc., Cleveland, Ohio.	86	151 684
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Hormel Inst., U. of Minnesota, Austin	165	140 216
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Houston U., Tex.	22	135 717
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Houze Glass Corp., Point Marion, Pa.	733	143 343
Howe Sound Co., Salt Lake City, Utah	315	140 954
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Hughes Aircraft Co., Culver City, Calif.	8	151 744
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Human Resources Research Office, George Washington University, Washington, D. C.	6	135 955
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Human Sciences Research, Inc., Arlington, Va.	157	140 706
Hunt Corp., Carlisle, Pa.	593	142 644
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Hupp Electronics Co., Carlisle, Pa.	462	137 416
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Hycon Eastern, Inc., Cambridge, Mass.	212	140 599
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Hydrodynamics Lab., Calif. Inst. of Tech., Pasadena	749	138 647
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Indiana Steel Products Co., Valparaiso	113	151 716
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Industrial Biology Research and Testing Labs., Inc., Philadelphia, Pa.	433	151 910
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Industrial Engineering Lab., New York U., N. Y.	422	142 150
Industrial Test Lab., Philadelphia Naval Shipyard, Pa.	353	140 888
Inland Testing Labs., Morton Grove, Ill.	85	151 701
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Institut de Recherches Scientifiques et Techniques du Centre-Ouest (France)	262	140 449
Institut fur Angewandte Matematik der Universitat Hamburg (West Germany)	356	136 190
Institute for Advanced Study, Princeton, N. J.	261	136 837
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Institute for Applied Experimental Psychology, Tufts U., Medford, Mass.	431	151 653
Institute for Cancer Research, Philadelphia, Pa.	309	137 113
Institute for Cooperative Research, Johns Hopkins U., Baltimore, Md.	25	128 187
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Institute for Fluid Dynamics and Applied Mathematics, U. of Maryland, College Park	90	135 160
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Institute for the Study of Rate Processes, U. of Utah, Salt Lake City	767	138 891
Institute of Andean Biology, Lima (Peru)	15	139 890
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Institute of Atmospheric Physics, U. of Arizona, Tucson	172	136 882
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Institute of Child Welfare, U. of Minnesota, Minneapolis	10	135 461
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Institute of Educational Research, Indiana U., Bloomington	566	142 441
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Institute of Flight Structures, Columbia U., New York	128	140 280
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Institute of Geophysics, U. of California, Los Angeles	31	139 913
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Institute of Industrial Research, U. of Louisville, Ky.	40	128 599
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Institute of Mathematical Sciences, New York U., N. Y.	108	139 860
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Institute of Metals and Explosives Research, U. of Utah, Salt Lake City	601	142 679
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Institute of Molecular Physics, U. of Maryland, College Park	115	139 853
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Institute of Optics, U. of Rochester, N. Y.	249	140 537
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Institute of Personality Assessment and Research, U. of California, Berkeley	299	140 865
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Institute of Polymer Research, Polytechnic Inst. of Brooklyn, N. Y.	219	140 541
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Institute of Statistics, U. of North Carolina, Chapel Hill	91	132 980
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Institute of Tech., U. of Minnesota, Minneapolis	91	136 488
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Institute of Theoretical Physics, Stanford U., Calif.	623	139 213
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Instituto de Quimica Fisica, Madrid (Spain)	167	136 867
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Instituto Nacional de Tecnica Aeronautica Esteban Terradas, (Spain)	25	135 587
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Instrumentation Lab., Mass. Inst. of Tech., Cambridge	189	139 954
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Intermountain Weather, Inc., Salt Lake City, Utah	444	142 413
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International Resistance Co., Philadelphia, Pa.	330	137 168
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Ionosphere Research Lab., Pennsylvania State U., University Park	31	135 544
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Ionosphere Research Lab., Pennsylvania State U., University Park (con.)	35	135 255
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Iowa Engineering Experiment Station, Ames	42	140 118
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Iowa State U., Iowa City	622	139 445
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Iowa State Coll., U. of Science and Tech., Ames	93	135 499
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Irvine, Vess E., and Co., Inc., Bronx, N. Y.	85	135 316
Israel Inst. of Applied Social Research	670	143 177
Israel Inst. of Tech., Haifa	381	136 995
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Instituto Elettrotechnico Nazionale "Galileo Ferraris" (Italy)	104	138 781
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Instituto Nazionale di Ottica (Italy)	306	139 642
ITT Labs., Nutley, N. J.	123	140 063
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James Forrestal Research Center, Princeton, N. J.	41	135 115
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Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena	74	139 901
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Johns Hopkins Hospital, Baltimore, Md.	160	140 219
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Johns Hopkins U. School of Engineering, Baltimore, Md.	175	140 321
Johnson, A., and Co., Inc.	72	137 565
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Joint Military Packaging Course, Rossford Ordnance Depot, Toledo, Ohio	209	151 325
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Kaman Aircraft Corp., Bloomfield, Conn.	179	140 343
Kansas U., Lawrence.	52	127 986
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Kearfott Co., Inc., Little Falls, N. J.	52	140 359
Kellogg, M. W., Co., Jersey City, N. J.	89	139 976
Kelsey-Hayes Co.	38	151 718
Kentucky Research Foundation, Lexington	309	139 504
Kentucky U., Lexington	440	137 470
Kidde, Walter, and Co., Inc. Belleville, N. J.	39	151 577
Kiruna Geophysical Observatory (Sweden)	667	142 908
Knights, James, Co., Sandwich, Ill.	53	140 010
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Laboratoire Mediterraneen de Recherches Thermodynamiques (France)	234	140 455
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Laboratorio di Meccanica Applicata del Politechnico di Torino (Italy)	492	142 227
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Laboratory for Magnetic Research, Carnegie Inst. of Tech., Pittsburgh, Pa.	247	136 060
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Laboratory for Nuclear Science, Mass. Inst. of Tech., Cambridge	20	140 075
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Laboratory of Algal Physiology, U. of Texas, Austin	153	140 218
Laboratory of Astrophysics and Physical Meteorology, Johns Hopkins U., Baltimore, Md.	447	139 471
Laboratory of Aviation Psychology, Ohio State U. Research Foundation, Columbus	157	151 781
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Laboratory of Climatology, Centerton, N. J.	576	139 413
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Laboratory of Molecular Structure and Spectra, U. of Chicago, Ill.	626	142 572
Laboratory of Physiological Hygiene, U. of Minnesota, Minneapolis	431	140 978
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Mallory Battery Co., Cleveland, Ohio.	331	137 165
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Mapping and Charting Research Lab., Ohio State U. Research Foundation, Columbus	32	135 336
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Marathon Electric Mfg. Corp. Wausau, Wis.	179	151 777
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		142 066
		142 234
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	574	142 553
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	577	142 508
	594	142 675
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	617	142 543
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	373	151 838
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